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FEBRUARY 1948

Plating

THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY

Volume 35 No. 2

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Plating on Zinc Base Alloy Die Castings

Determination of Silica in Nickel Baths

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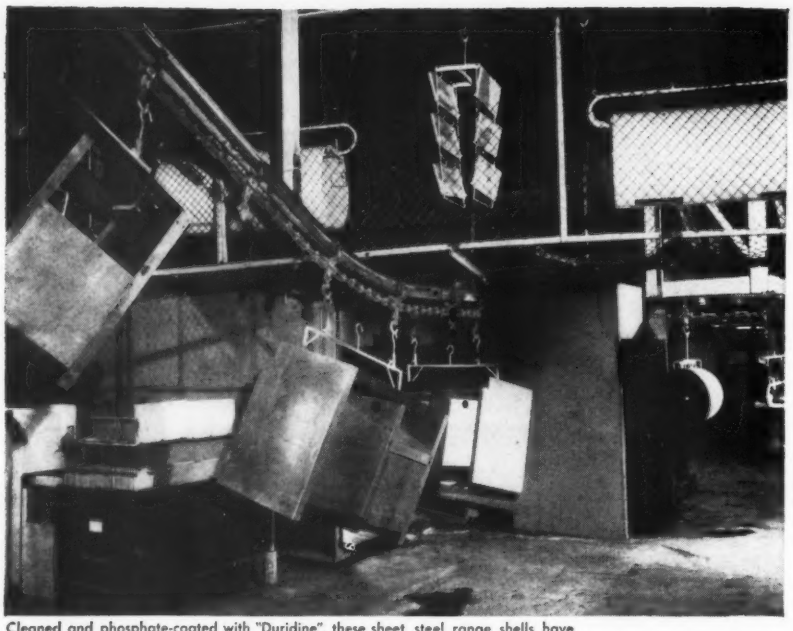

Cleaned and phosphate-coated with "Duridine", these sheet steel range shells have acquired a thin, tight, hard, crystalline phosphate coating—the ideal preparation for long finish life and enduring beauty.
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Chemicals for Rust Proofing Paint Bonding

American Chemical Paint Co.
TECHNIGRAM
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Branch News

Coming Events

DAYTON BRANCH

THIRD ANNUAL SESSION AND DINNER PARTY

The Dayton Branch of the American Electroplaters' Society will hold its Third Annual Educational Session and Dinner Party on February 14, 1948 in the Miami Hotel in Dayton. WALTER E. MOLINE of National Cash Register Company, and WILLIAM G. CRYDERMAN of Hanson-Van Winkle-Munning Company are co-chairmen.

Arrangements have been made for the following speakers and topics for the Educational Session, which will start at 2:00 P. M.:

MR. BERNARD C. CASE of Hanson-Van Winkle-Munning Company, "Electrolytic Purification of Solutions".

MR. M. C. WELKER of American Cyanamid and Chemical Corporation, "Demineralized Water in the Plating Room"

MR. M. L. MOLL of Mine Safety Appliances Company, "The Air We Breathe", a 32 minute film.

The dinner party will start at 6:30 P. M. in the Main Ballroom of the Miami Hotel. Music will be furnished by Earl Holderman's orchestra and an elaborate program of entertainment has been planned. The dinner is $5.00 per plate.

NIAGARA FALLS REGIONAL MEETING

May 15, 1948
Auspices of
TORONTO BRANCH A. E. S.
General Brock Hotel
Niagara Falls, Ontario

EDUCATIONAL SESSION AT 2:30 P. M
Chairman
Mr. Edward P. Blandy
President, Toronto Branch
Speakers
Dr. H. L. Kellner
Research Director,
Lea Manufacturing Company
Mr. Charles M. Belvin
Chormium Corporation of America

BANQUET AT 6:30 P. M.
Speaker
Mr. Joseph Bliss
Oneida, Limited
"The Romance of Silver"
Dancing at 9:00 P. M.

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BALTIMORE–WASHINGTON BRANCH

On December 2, members met at the National Bureau of Standards. Vice-President Chester Bethke presided with twenty-five in attendance.

The War Department movie describing the "Manufacturing Process for Standard Sixty-Inch Reflectors" was shown. NEWELL F. BLACKBURN of the Engineering Research and Development Laboratories at Fort Belvoir, Va., explained the process and answered questions.

GRACE RIDDELL, *Secretary*.

BALTIMORE-WASHINGTON BRANCH

The January meeting of the Branch was held on the evening of the sixth at the American Hammered Piston Ring Company in Baltimore. Twenty-one were present.

"Preview of Progress" was the topic of DR. WALTER A. DEW of the E. I. du Pont Company. He discussed the extent of progress in our standard of living that is due the vast research during recent years, and traced the history of the development of celluloid, cellulose acetate, nylon, bakelite, polythene, neoprene, and others. Products yet to be found on the market were exhibited.

GRACE RIDDELL, *Secretary*

BOSTON BRANCH

Three applicants were elected to membership and eight new applications were received at the meeting on December 4.

Two tickets to the 13th Annual Educational Session and Banquet on April 17 will be furnished each man on record as a member of the Branch in the Armed Services at the end of the war. The charge will be approximately $7.50 per ticket.

Since we have twenty-five members residing in Worcester or Worcester County and since there are thirty or forty additional platers who probably would join the Branch if an occasional meeting was held there, it was voted to hold the first meeting in Worcester on the third Thursday in March with HAROLD MARCUS of Leominster, Mass., as chairman.

The Board of Managers was empowered to suspend members in arrears at their discretion.

MR. JAMES J. DEVER of the Mine Safety Appliance Company, who spoke about "Health and Safety Hazards in the Electroplating Industry", first showed a film entitled *The Air We Breathe* which presented the different types of material that affect the respiratory system, such as pollen, dust, fumes, etc., and how their effect can be prevented with masks and respirators.

Their development was traced from the early days of the Greeks to the present time. The testing methods used by the Bureau of Mines for new types of respi-

Safe on any surface

There's one metal cleaner that just doesn't fall down on the job. That's Wyandotte Metal Cleaner No. 38. This *balanced* product can solve practically all the cleaning needs of the average plant with economy and efficiency.

Wyandotte Metal Cleaner No. 38 is all-soluble. It dissolves quickly, rinses easily and completely. It is designed to correct water conditions . . . wet rapidly . . . give long life in solution. It is inhibited to prevent corrosion of the metal being treated.

Wyandotte Metal Cleaner No. 38 is being used successfully for electro-cleaning of ferrous metals, as well as copper and brass. It is a proven reverse current cleaner for zinc-base die-castings. It is giving satisfaction when used in electro-cleaning baths on hand-operated, semi- and full-automatic line . . . in still-cleaning solutions . . . in tumble barrel equipment . . . in pressure spray and rotary type metal parts washing machines.

Let your Wyandotte Representative tell you more about the advantages of Wyandotte Metal Cleaner No. 38. He's always at your service.

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When DARCO* has removed the colloids and organic matter *not* removed by mechanical filtration methods, your solution will come out clean and crystal clear.

A little DARCO goes a long way! A few cents' worth purifies a hundred gallons of solution. Use it in conjunction with your filter to purify plating baths for bright nickel, copper, iron, zinc, cadmium, tin, gold and silver.

DARCO is America's oldest trade mark for activated carbon. It stands for a quality product. Moreover, DARCO technicians will answer your questions concerning ways to increase quality and production.

Is your plating bath as clean as the water used in your final rinse?

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DARCO CORPORATION

60 East 42nd Street, New York 17, N. Y.

rators were described. Various types of filters, masks, and respirators were on display and described in detail. The use of the filters to remove nuisance dust, mists, toxic metal dust, metallic fumes, paint, spray, light organic vapors and acid gases were illustrated and discussed.

A lengthy discussion period followed.

GEORGE P. SWIFT, *Secretary*

BRIDGEPORT BRANCH

The December 6 meeting was very poorly attended, by only eleven persons, due to the bad weather condition.

It was decided to buy a Christmas Seal Bond from the Visiting Nurse Association to help the campaign against tuberculosis. PRESIDENT GOTTHARD agreed to collect data on the Branch's history as requested by the Executive Secretary. WILLIAM A. EHRENCHRONA was appointed chairman of the committee for the Old Timers Night.

A short discussion of plating problems concluded the meeting.

JOSEPH G. STERLING,
Secretary-Treasurer

BUFFALO BRANCH

The November meeting featured a talk on Back Stand Polishing by MR. J. L. MARTIN and his associates at the Behr-Manning Corporation. A model was set up to demonstrate the value of the method.

Every good A. E. S. man in his best bib and tucker and with his best gal on his arm appeared at the Annual Christmas Party on December 14 in the gorgeous Sanford White Room of the Markeen Hotel. Despite incapacitation caused by a sumptuous repast, the gang shook a mean leg to Joe Armbruster's music. Door prizes donated by members were distributed and a grand time was had by all.

H. A. FUDEMAN, *Secretary*

COLUMBUS BRANCH

During the regular November meeting, the members heard MR. C. J. HINTON of the Aluminum Company of America describe the many finishes, both electrochemical and organic, which are being used on aluminum today. Examples of these finishes were shown in an attractive display. A motion picture, showing the diversified uses of aluminum, concluded Mr. Hinton's presentation.

MR. W. M. PHILLIPS, Research Laboratories Division, General Motors Corporation, discussed "Stress-Strain in Electrodeposited Nickel" at the December meeting, which was held at Battelle Memorial Institute. The work described was a continuation of the research detailed in a presentation at the 1947 A. E. S. Convention in Detroit. A new and simplified method for stress-strain measurement of electrodeposits was ex-

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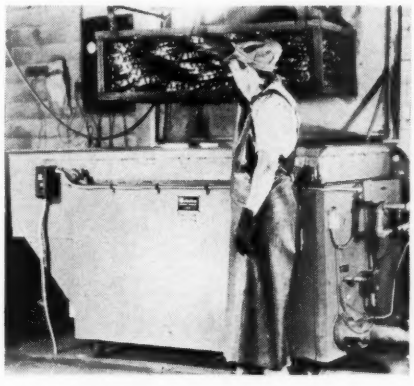
Magnus 92K ... A General Purpose Alkaline Metal Cleaner with Many Practical Advantages

Magnus 92K is a concentrated non-foaming *liquid* cleaner. Easy to make up in accurately proportioned solutions, instantly dispersed. No troubles with caking, lumping or soaking up water from the air. No unpleasant fumes or odors, either! It is ideally adapted to both mechanical washing machines and electrocleaning tanks, as well as still tanks. Safe for all metals, including the soft metals of diecastings, where ordinary alkaline cleaners cause much trouble and expense due to spangling, etching or corrosion. 92K is particularly effective in cathodic electrocleaning of zinc or aluminum.



Where you have dragover troubles, you'll find Magnus 92K to be most effective. It is much more freely rinsing than ordinary alkaline cleaners. (Run-off in the drainage interval between emergence from the cleaning solution and the rinsing stage can be made even more rapid and thorough by the addition to the cleaning solution of a few ounces of Magnus NXL, a special synthetic wetting agent.) For difficult cleaning on steel parts, 94K is recommended.

Of course Magnus 92K works unusually well in the Magnus Aja-Dip Cleaning Machine. Here its fast chemical cleaning action is greatly speeded up by the dynamic mechanical agitation provided by the machine. The solution is not moved around the work. The work itself is moved up and down IN the cleaning solution 70 or more times a minute. This swirling, pulsing, agitating effect not only speeds the cleaning action almost unbelievably, but also insures much better quality of cleaning. The use of this machine with 92K is particularly desirable in cleaning die castings and soft metals, because of its ability to shorten cleaning time and avoid the slightest danger of alkaline attack.

Magnus Chemical Company, 41 South Avenue, Garwood, N. J. In Canada—Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que. Service representatives in principal cities.

For Greatly Improved Micro-Finishes

If you want a better grade of micro-finish on molds, gauges, tools, dies, precision parts or rolls, the technique of using Magnus Diamond Micro-Finishing Kits with "Color Code" is worthy of most careful investigation. Highest quality diamonds, meticulously graded, plus the unique Magnus system of color identification not

only insures consistently duplicated micro-finishes, but ends your dependence on highly skilled personnel. With the Magnus Kit new operatives can quickly learn to do superfine work.

Write for Bulletin "Superfinishing."

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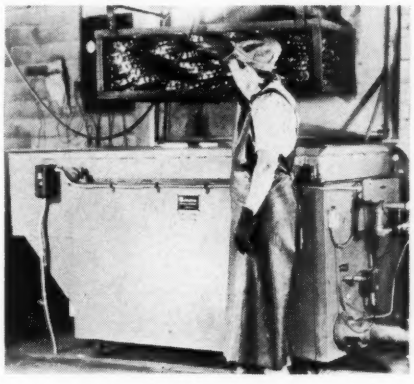

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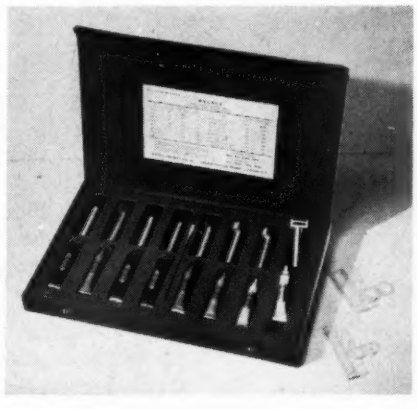

only insures consistently duplicated micro-finishes, but ends your dependence on highly skilled personnel. With the Magnus Kit new operatives can quickly learn to do superfine work.

Write for Bulletin "Superfinishing."

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The New BLACK MAGIC Zinc Black Protects Important Parts

ON THE WEBSTER-CHICAGO WIRE RECORDER

Black-Magic ZINC BLACK is used on the spool of the Webster-Chicago Wire Recorder shown below because it does not build up the diameter and is a good bond for the silk screen painted trade name.

Black-Magic ZINC BLACK on the mandrel resists the abrasion of a felt brake which it engages, affording positive action without revealing bare metal.

Black-Magic ZINC BLACK is the modern treatment for zinc base die castings and zinc fabrications —as an attractive final finish and an effective corrosion and abrasion resistant. It is also an excellent bond for paint, and when so used, it affords full protection for unpainted areas.

Because of these advantages, Black-Magic ZINC BLACK is becoming "standard practice" wherever product sales and service life are important.

Black-Magic ZINC BLACK, used on the take-up reel, resists the abrasion of the magnetic recording wire which rides on the periphery.

Write for the "Black Book" of details on our zinc black and other Black-Magic metal finishes. Also, for a first-hand acquaintance with this zinc black, suggest you send us a product for sample processing without obligation.

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PHILADELPHIA: Albert Printz, Germantown *CLEVELAND: Universal Paint & Varnish Co.* *DETROIT: The Danell Co.* *MILWAUKEE: A. B. Plating Supply Co.*
ST. LOUIS: G. S. Robins & Co. *DALLAS, TEX.: Texokana Supply Co.* *LOS ANGELES: Barber-Webb Co.* *OAKLAND: Geo. A. Kushman Co.*

plained, and numerous examples of data obtained by this method were given. Mr. F. L. Clifton, who has been associated with Mr. Phillips in this work, was also present.

A. B. Tripler, Jr.,
Second Vice-President.

DAYTON BRANCH

Walter Moline has been appointed General Chairman of the Third Annual Educational Session and Dinner Party on February 14 in the Miami Hotel. Those who have attended either of the preceding meetings will want to arrange to be with us.

We were singularly honored by having Past President Frank Savage with us in our last regular meeting. The experience he added to our round table discussion heightened the interest and increased the benefits to all those who attended.

In our October meeting, Mr. Kenneth Tator, of Industrial Lining Engineers, Inc., brought us up to date on the use of plastics as protective coatings in the plating industry. His many practical illustrations made his presentation most useful to all present.

Four new members were welcomed.

E. W. Rehme, *Secretary*

DETROIT BRANCH

The Annual Educational Session was held at the Hotel Statler on December 6, Walter Pinner presiding.

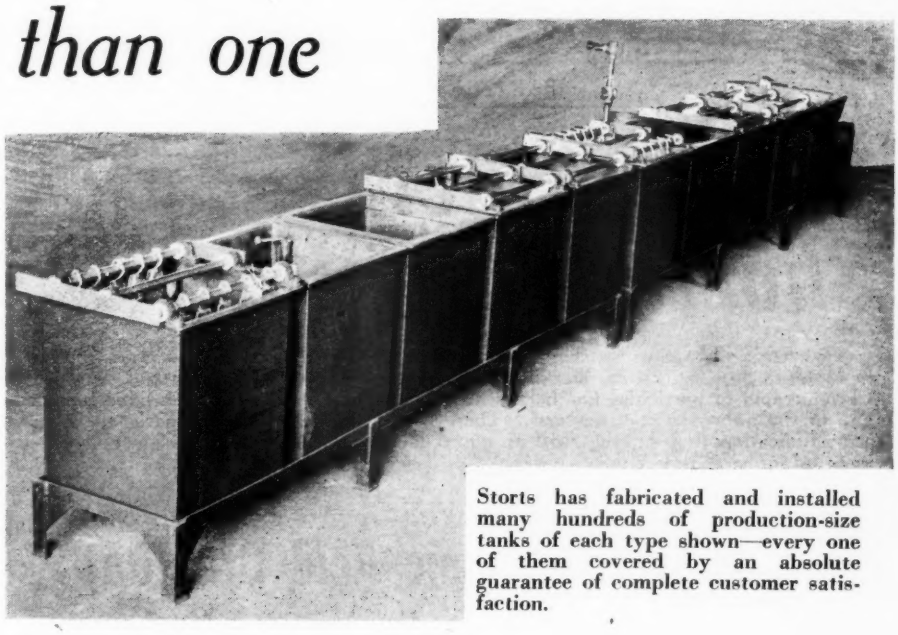
We were favored with a symposium by five excellent speakers on the subject of design and construction of a modern plating plant.

Mr. L. Moye, of the Utley Company, covering "General Construction", pointed out the importance of providing a plant capable of withstanding the ravages of the various solutions encountered in plating.

Mr. George L. Nankervis of the George L. Nankervis Company very capably treated the subject of "DC Power Transmission and Piping". The advantages in lightness and ease in handling gained from using aluminum bus bar were cited, together with cost data to show that aluminum bus bar can generally be installed at a lower cost than the conventional copper bus bar. We also pointed out that rack contacts are a part of the DC circuit and gave resistance data for various common methods for fastening contact devices to rack spines. Newly available rack coatings and their resistance to plating solutions were discussed.

Mr. L. C. Borchert of the Houdaille-Hershey Corporation presented a very instructive joint paper with Mr. R. B. Kinnaman of the same company on "The Practical Significance of Good Power Transmission". He emphasized the effects of stray currents and gave methods for determining when they existed and how to find them.

A Pilot — *in more ways than one*



Storts has fabricated and installed many hundreds of production-size tanks of each type shown—every one of them covered by an absolute guarantee of complete customer satisfaction.

THIS Stortswelded pilot line confirms the correctness of plating solutions and procedures with short runs before baths are made up for full production in larger plating tanks. All suggested improvements can be tested here for utility and practicability.

Almost any type of plating solution can be used in this line. Some of the tanks are unlined, some have lead linings and others have rubber linings. All necessary copper work is included. There is one spray tank, with quick acting valve, for spray rinsing.

Conversely, the great versatility and flexibility of this pilot line shows the way to sustained satisfaction in plating tank cycles—the selection of the most suitable tank material or lining for long service in production. Having all types of construction and all protective materials available, Storts plays no favorites—but recommends to every customer the specification which means the most in performance. That is the safe, sure way to get the utmost value for every equipment dollar. Get our estimate on your next requirements—large or small.

STORTS WELDING COMPANY
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42 Stone Street Meriden, Conn.
Manufacturers of Welded Fabrications to Specification

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INDUSTRIAL **Plating Facts** DECORATIVE

PUBLISHED IN THE INTEREST OF THE PLATING INDUSTRY

Vol. 1 No. 1 BART-MESSING CORPORATION • BROOKLYN 6, N. Y. FEBRUARY 1948

Chromic Acid Shortage Critical

New York—The raw material shortages have been growing at an alarming rate. Chromic acid in particular has been scarce due to the unprecedented demand. There is no indication that supplies will be more plentiful for some time. It is advisable that users of chromic acid take every precaution to conserve available material.

Plating plants using chromic acid solutions should carefully check their equipment and add whatever devices are necessary to safeguard their supply.

Save 33% of Chromic Acid Drag-Out

Diluted chromic acid solutions can be used most effectively, says Dr. George Dubpernell of United Chromium, Inc., Waterbury, Conn. The following excerpt, written by Dr. Dubpernell, appears in the current issue of the "Guidebook and Directory for the Metal Finishing Industries," published by Metal Industry Publishing Co.

"Solutions of lower concentrations of chromic acid can be used, for example 33 oz./gal. In such case, the total catalyst acid radical content of the bath must be adjusted so that its effect is equivalent to 0.33 oz./gal. of sulphate so as to maintain the ratio at its optimum of $\frac{100}{1}$. While baths containing 33 oz./gal. of chromic acid have a slightly higher current efficiency than those containing 53 oz./gal. of chromic acid, they have lower conductivity and, therefore, require high voltage for a given current density."

Higher Voltage Rectifier Permits Savings of Chromic Acid

By E. R. REDLHAMMER

Chief Engineer, Bart-Messing Corp.

A 9 volt selenium rectifier has been developed that fulfills the requirements for the maintenance of original current densities in a diluted chromic acid solution because it assures ample voltage reserves.

The 9 volt selenium rectifier is the result of better equipment engineering and modern advancement in the art of making selenium cells. This results in a higher overall efficiency and even greater utilization of the rectifier element. The additional costs as compared to the older 6 and 8 volt designs are slight. Of great importance is the necessity of being sure that any rectifier used in chromium plating should definitely provide voltage adjustment without interruption of plating current to prevent grey deposits.

New Bart-Messing Service

This is the first issue of "Plating Facts." Watch for future issues. We welcome comment to assist us in rendering a greater service to the Plating Industry.

Limited Supply of Chromic Acid Forces Consumer to Conserve

By B. S. FLUG

Tech. Eng., Bart-Messing Corp.

Careful check of your plant should be made to consider every possibility for chromic acid conservation. From my observation I noted that the common neglects are as follows:

1—Drag-out recovery tanks with adequate drainage time.

2—Polystyrene tubes on solution to cut down loss due to mist going up the blower.

3—Use of addition agent to chromium plating solution to cut down mist carried out by gases.

4—Installation of centrifugal recovery unit in the ventilation system to recover a good portion of the chrome which goes up the blower.

Dimensions—68" high x 26" deep x 38" wide. Input—200 - 220 - 440 volts. 3 phase - 60 cycles

Sel-Rex 9 Volt 2500 Amps.

SELENIUM RECTIFIERS

for economy
for maximun efficiency
for long service
for minimum maintenance

SPECIFICATIONS . . .

- Efficiencies over 72% at full load up to 83% at 20% load.
- Tap switch adjustment of output provides voltage adjustment without breaking current to the tank.
- Newest design selenium elements over 7700 sq. in. of effective rectifying area (approx. 310 sq. in. per 100 amps.). Triple impregnated for corrosion protection.
- Ball bearing fans.
- Positive overload protection.
- Magnetic starter and push buttons.
- Weston Meters and Shunt.
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MR. VICTOR P. JOHN of the American Blower Corporation, in speaking about "Ventilation", touched on the legal aspects of the subject and the requirements on a proper system, and listed specific ventilation values for various plating room solutions.

MR. GUY M. COLE of the Fisher Body-Ternstedt Division of General Motors Corporation gave an excellent paper entitled "Filtration" which, being illustrated with slides, was especially easy to follow. A survey of filtering practices in a number of plating plants furnished data on the systems employed, their effectiveness, and what is considered ideal filtration results.

We were honored by the presence of DR. S. WERNICK, Immediate Past President and long time Honorary Secretary of the Electrodepositors' Technical Society, England. He spoke for a few minutes of his impressions of American plating industry and expressed the hope that there might be much better liaison between our countries on plating matters.

Following the educational session, the evening was devoted to the usual high caliber banquet and entertainment program much to the enjoyment of all those present.

R. H. DUDLEY, *Publicity Chairman.*

HARTFORD BRANCH

The regular monthly meeting on November 17 attracted the largest audience of the year. A group in excess of one hundred members and friends was given a rare treat by A. E. S. SECOND VICE-PRESIDENT A. W. LOGOZZO of Nutmeg Chrome Corporation of this city who spoke on "Bright Nickel and Decorative Chrome Plating". A tremendous amount of knowledge on this subject, amassed through many years of practice and continuous study, was presented and greatly appreciated by the audience.

An excellent movie in technicolor describing the *Manufacture of Steel* was shown. Much credit should be given STANLEY PLATOZ who is the "Booking Agent" for the movies.

Finally the entire group was invited to partake of refreshments, an old and approved custom at regular meetings.

A. J. DANKEVICH, *Secretary.*

INDIANAPOLIS BRANCH

About thirty-five members and guests were present at the regular monthly meeting on December 3.

The Spring Dinner-Dance will be held in the Indianapolis Athletic Club on a Saturday in April. PRESIDENT MARVIN O. CRAWFORD appointed the following committee chairmen to handle the affair:

General Chairman, QUENTIN O. SHOCKLEY; Technical Chairman, DR. A. M. MAX; Music and Entertainment, THOMAS O. EVANS and ALBERT KRIESE; Ticket Sales and Printing, MAX MALVASE; Publicity and Program, HOWARD PHILLIPS and HERB KENNEDY; Door Prizes, L. C. HESOUN; Toastmaster, REX W. OYLER; Banquet, L. C. HESOUN and H. PHILLIPS, assisted by M. MALVASE, WILLIAM NIEHAUS, ED BRUCK, and LOUIS WORRELL.

One applicant was elected to membership. Librarian Dr. A. M. Max was appointed Chairman of the Research Fund Committee.

The technical portion of the meeting consisted of an Information Please session conducted by Dr. Max. The experts on the panel were ROBERT WAGNER of The Guide Lamp Division of General Motors Corporation, WALTER BINAI of Clark Chemical Company, and WILLIAM F. CASTELL of American Bearing Corporation. Chromium plating, cadmium plating, bonderizing, and electropolishing problems were discussed.

J. MONAGLE, *Secretary.*

JACKSON-LANSING BRANCH

The October meeting was held on the fourteenth in Hotel Hayes' Crystal Room, Jackson.

The after-dinner program consisted of two talks and a sound movie. MR. CHARLES BITTERS, Branch member and regional representative of the Forbes Finishes Division, Pittsburgh Plate Glass

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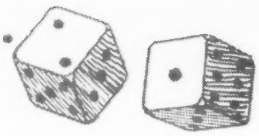

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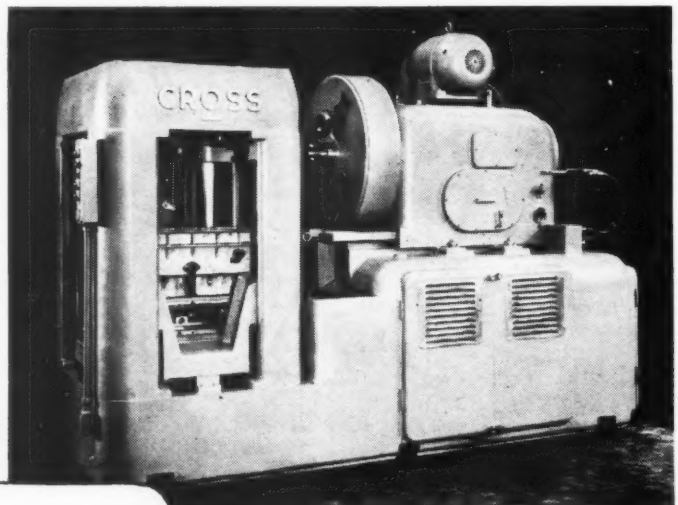

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Company, sponsors of the meeting, introduced the speakers, MR. ROBERT F. WYSOCKI and DR. DONALD R. SWAN. Mr. Wysocki, in his talk on "Current Finishes", traced the development of commercial organic finishes from antiquity to the present, touching upon the resins that have found extensive use in both the past and present. Dr. Swan discussed organic materials not in commercial use now but which show promise to become "Finishes of the Future".

After the talks a sound color film, *Zinc and Its Uses in Paint*, was shown.

U. J. FORSYTH, *Secretary-Treasurer*.

JACKSON-LANSING BRANCH

The Lobby Lounge of the Hotel Porter, Lansing, Mich., served as the meeting place for the November 11 meeting.

A very interesting sound film, *An American Success Story—The Story of Synthetic Rubber* by the Goodyear Tire and Rubber Company, was shown along with a couple of short film subjects.

The Northwest Chemical Company of Detroit sponsored the meeting and its technical director, MR. BERT F. LEWIS, took as his theme a correlation of faulty plating-room practices and service failure of the plated articles. This is a very fertile subject in the automotive industry, and Mr. Lewis handled it capably, calling for questions from the floor to help illustrate the various points.

U. J. FORSYTH, *Secretary-Treasurer*.

LANCASTER BRANCH

The Second Annual Ladies' Night was held on December 5 in the Conewago Inn, nine miles north of York, Pa. There were eighty-five members and guests present. The invocation was given by PRESIDENT THEODORE R. SCHWALM. After a delicious turkey dinner, we were led in singing by CHRIST BRUBAKER with MRS. GLADYS ROBERTSON at the piano.

The evening's entertainment consisted of a musical contest, movies, bingo, and a Dr. I. Q. quiz program. Many prizes were awarded during the contests. NORMAN GEBERT was in charge of bingo, and LE ROY HAINS was Dr. I. Q.

Door prizes were awarded to holders of tickets drawn at various times during the evening. Each lady was also presented with a compact and a bottle of perfume.

The committee for this affair consisted of ROLAND HOENSTINE, Chairman; HARRY HOVIS, CHARLES SNYDER, NORMAN GEBERT, and ELLIS HUNTER.

H. CLAY BRUBAKER, *Secretary*.

LOS ANGELES BRANCH

An excellent steak dinner at $2.55 was served at the meeting at Scully's on December 10, attended by sixty-one members and guests.

MR. FRED C. POULSON of the Porter-Cable Machine Company showed a film,

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1. IMPROVE YOUR PLATING!
2. SAVE YOU MONEY!
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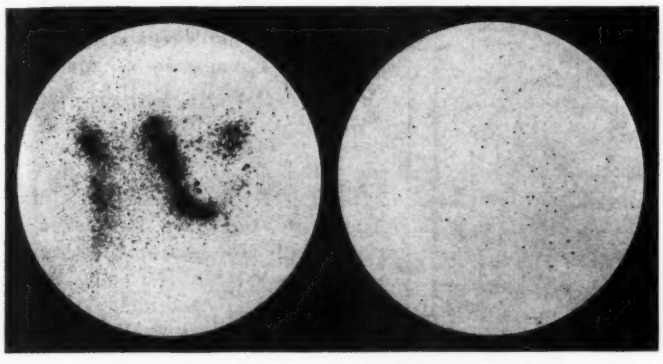

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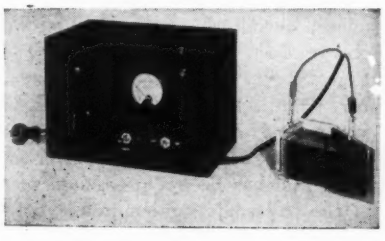

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CADMIUM ADDITION AGENTS FOR PERFECT PLATING THAT FOR MORE THAN THREE YEARS HAVE GIVEN MAXIMUM:

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A Machine of the Age, illustrating the uses and operation of the Porter-Cable wet belt grinder, and described the contour grinder and other abrasive units manufactured by his company. A short film with the highlights of the Louis-Conn and Louis-Baer fights were also shown.

Two new members were welcomed.

M. D. RYNKOFS and ERNEST LAMOUREUX were appointed to write the history of the Branch. The condition of FRANK RUSHTON was reported to be quite serious; he is at Sawtelle Hospital.

DEAN WILLIAMS, *Secretary*.

MELBOURNE BRANCH

The twenty-ninth regular meeting was held at the Chamber of Manufactures on November 24. The usual lecture was replaced on this occasion by an informal discussion of "Old Time Plating", during which N. L. CARTER interviewed MESSRS. W. HART and F. QUINTON. These two gentlemen have been associated with the electroplating trade for many decades, Mr. Hart starting as an apprentice in England in 1879, while Mr. Quinton was found to be relatively a juvenile, having delayed his introduction to plating until just after the turn of the century.

Mr. Hart had a varied experience in England before coming to Australia in 1923 to become associated with a well-known manufacturer of electrical appliances; during the war years he was in charge of the plating section of the Munitions Supply Laboratories at Footscray. Mr. Quinton commenced plating as a youth in Hobart, Tasmania, but transferred back to the mainland after several years and has been a prominent member of the electroplating community in Melbourne for many years. He was closely associated with the introduction of chromium plating in Australia, and both he and Mr. Hart are considered experts in this field.

Many of those present took the opportunity to ply questions and many interesting discussions ensued. Particular interest was shown in the several very old plating books exhibited by Mr. Quinton. When the meeting closed, it was voted unanimously one of the most interesting held during the year.

N. L. CARTER, *Review Correspondent*.

MONTREAL BRANCH

Twenty-three members and guests were present at the meeting on December 3.

PRESIDENT BOSTON introduced the speaker, MR. J. H. CHARLES, who read a very interesting paper on "Electrodeposition on Glass". It touched upon six phases: preparation of the blank for fluxing, preparation of flux, firing the flux into the blank, preparation of blank before plating, plating of blank, and mechanical polishing. Mr. Charles gave details of the formula for the flux as well as the method of preparing it and the

manner of application and firing. Samples showing each phase of the process were exhibited.

WILLIAM GLOVER, *Secretary.*

NEW HAVEN BRANCH

MR. FRANK K. SMITH, President of Technic Inc., Providence, R. I., who spoke on "Electrodeposition of Gold and Gold Alloys" at the November meeting, proved an authority in the art of plating precious metals. The members enjoyed an interesting and instructive evening.

The delegates were instructed to vote in the negative on the proposed increase of A. E. S. active membership dues.

B. J. GAFFNEY, *Secretary-Treasurer*

NEW YORK BRANCH

The meeting on December 12 was opened by PRESIDENT GEORGE SCHORE.

MR. HORACE SMITH of the Newark Branch personally extended an invitation from his Branch to its Educational Session and Banquet.

MILTON NADEL reported on the progress of his committee for the New York Branch Banquet in February, 1948.

Our meeting was adjourned at 8:45 P.M. so that the members could partake of the refreshments that were served in celebration of the coming Holidays.

ALBERT G. FUSCO,
Recording Secretary.

PHILADELPHIA BRANCH

FIRST VICE-PRESIDENT TOM RODGERS opened the November 28 meeting with thirty-five members present.

GEORGE GEHLING, A. E. S. Past President, was reported seriously ill in the Episcopal Hospital.

Ten applicants were elected to membership, and four new applications received. There was one resignation.

LIBRARIAN HIRSCH introduced MR. ARTHUR S. KOHLER, Chief Chemist, Fredrick Gumm Chemical Company, who discussed "Tumble Finishing of Small Parts". Mr. Kohler divided parts into four classes: self-rolling parts, parts which will roll in a medium, parts which may be finished after having been racked in the barrel, and fragile, nesting, or heavy parts which are not suitable for finishing by rolling. Having discussed each class separately in a very satisfactory manner, he answered the many questions put by the members.

PAUL MENTZER, SR., *Secretary.*

PITTSBURGH BRANCH

The meeting on November 13 was preceded, as usual, by a dinner attended by thirty members and guests. Approximately sixty-five were present at the meeting.

PRESIDENT HENNESSY appointed a committee consisting of MESSRS. SAYLOR, WOZD, and KELLER to supply information requested by the Executive Secretary about the Branch's history. Two applicants were elected to membership.

LIBRARIAN GOLDBACH introduced as the speaker of the evening MR. W. M. PHILLIPS of General Motors Research Laboratory. His subject, "Stress and Strain in Nickel Deposits", proved to be very interesting. Some new ideas were explained, and the many slides showed the equipment used and the data obtained. A short motion picture served to demonstrate one of the methods for determining stress and strain. Mr. Phillips was accompanied by MR. FRANK CLIFTON as well as one of his other associates, both of whom took part in the lengthy discussion which followed.

There was quite an unusual display of casket hardware by the National Casket Company of Pittsburgh.

RICHARD A. DIMON,
Secretary-Treasurer.

PITTSBURGH BRANCH

The December 11 meeting was preceded, as usual, by a dinner at which twenty-five members and guests were present. PRESIDENT HENNESSY opened the meeting by regretfully announcing the death of MR. L. C. CONRADI, who had been a member of our Branch since 1943. The new British journal, *Electroplating*, will be subscribed to; copies will be available at the Carnegie Library. A committee consisting of SAM JOHNSTON, ED WASHBURN, DOUG PATRICK and KEN TATOR was appointed to determine where a suitable screen could best be obtained.

LIBRARIAN GOLDBACH introduced the two speakers. MR. F. SHAPOE, patent attorney for the Westinghouse Electric Corporation for a number of years, discussed "Patents as Related to Electrochemistry" and demonstrated his thorough knowledge of this subject by a systematic approach to the various phases

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production up!

AT TROY SUNSHADE CO., TROY, OHIO

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WEARS TWICE AS LONG - NO RAVELING - NO RAKING

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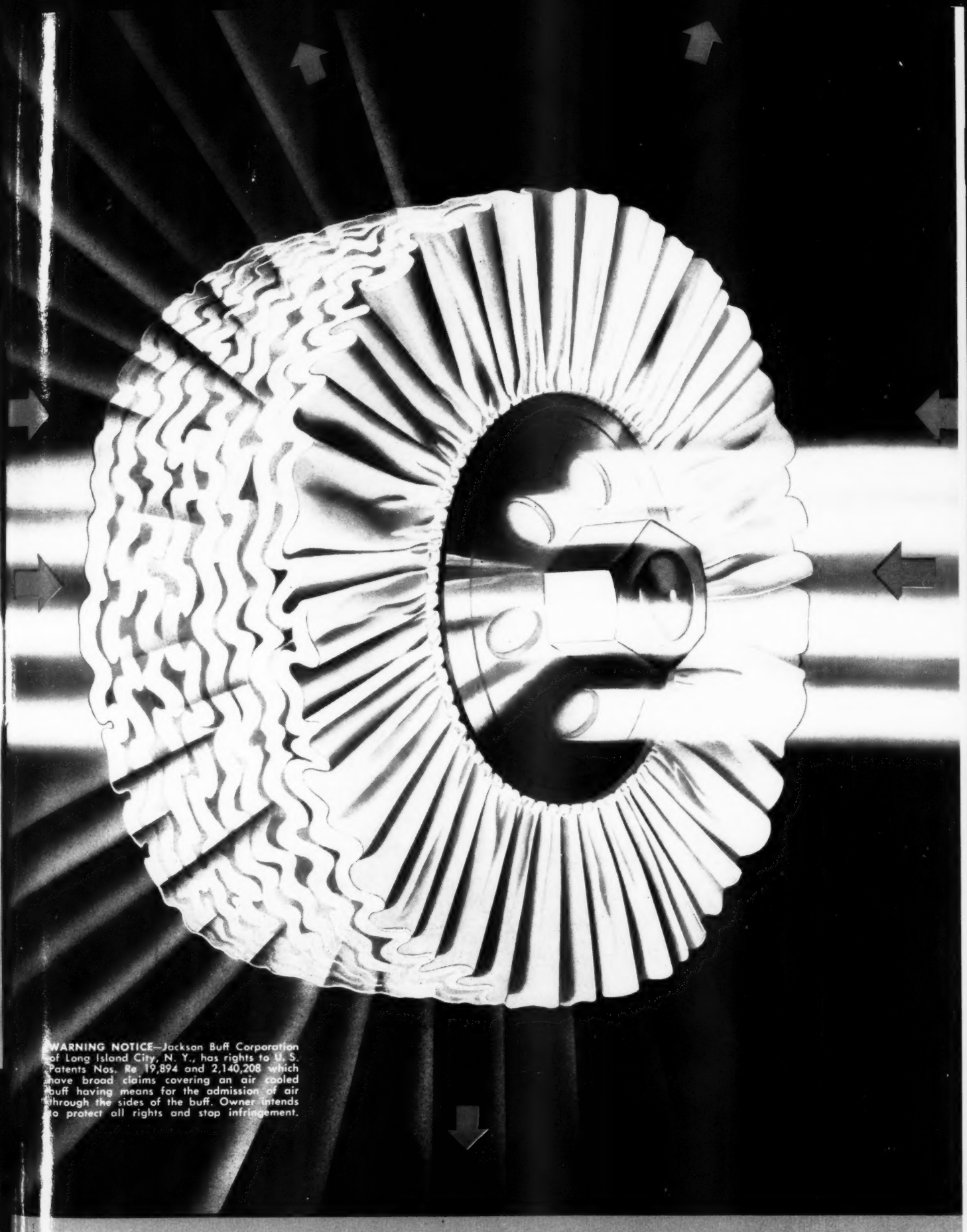
Jackson Airway Ventilated Buffs produce better work faster . . . and at lower cost. They eliminate burning and ridging . . . save buffing compounds . . . wear twice as long . . . because Jackson patented construction incorporates full ventilation permitting air to cool the buff internally. Whether your buffing equipment is hand operated, semi-automatic or fully automatic, comparative tests with ordinary buffs will definitely prove a 50% saving. The manufacturers of modern buffing machines specify Jackson Airway Ventilated Buffs for best results. Conclusive proof that Jackson Airway Ventilated Buffs will save you 50% is yours for the asking. Write, wire, or phone The Jackson Buff Corp., 21-03 41st Ave., Long Island City 1, New York.



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of patent protection. Following this talk he answered a number of questions raised by erstwhile inventors.

A. E. S. Past President Walter Pinner, who has just returned from the International Conference on Electrodeposition in London, England, summarized briefly some of the papers which were presented there, and followed this with a very interesting and highly amusing account of some of his personal experiences. This part of the talk included a description of a discussion with Pierre Jaquet, the celebrated French electrochemist, which was handicapped by Pinner's speaking no French and Jaquet's speaking no English! The talk was concluded with slides of the high points of his trip to England and Paris, including some photographs showing the extensive bomb damage to London and other parts of England.

Richard A. Dimon, *Secretary*

SAN FRANCISCO BRANCH

The members and their wives enjoyed the Annual Dinner-Dance held at Club Lido on December 12, with an attendance of forty-seven.

The steak dinner was delectable, and the floor show which featured Giovanni, "The International Pickpocket", was equally enjoyed by all.

At the conclusion of the dinner, several door prizes were awarded, the donors being A. J. Lynch Company, L. H. Butcher Company, Braun-Knecht-Heimann Company, E. I. du Pont de Nemours Company, and various associate plating shops.

The consensus was that "a good time was had by all" and that the annual get-togethers should be continued.

Jack Hite, *Secretary-Treasurer.*

SOUTHEASTERN BRANCH

The technical portion of the meeting on December 12 was a general bull session on shop problems which proved most helpful to all present.

Alvin Christian, Fred Fletcher and Victor Baron were appointed to the committee which will arrange the Christmas Party next year.

William T. Weymouth,
Secretary-Treasurer.

SYDNEY BRANCH

The meeting on November 11 on the premises of Austral Industrial Products, Ltd., was attended by thirty-six members and visitors. The main business was the election of officers for the year commencing January 1, 1948. E. J. Wright was reelected President and the following were elected to assist him:

First Vice-President—W. Paterson
Second Vice-President—T. Wilson
Secretary-Treasurer—J. R. Godfrey
Librarian—T. O. Kolts
Board of Managers—F. R. Bellenger, G. R. Trevena, and W. H. Millward

The lecture for the evening was delivered by Mrs. Coulson, chemist at Austral Industrial Products, Ltd., who also gave a practical demonstration of high speed copper plating. This was followed by films provided by Austral Products.

The educational committee reported that the Branch hoped to have a yearbook issued to members and others in the trade by the end of January, 1948.

There was no meeting of the Branch in December owing to the Annual Smoko being held at that time.

J. R. Godfrey, *Secretary.*

SYRACUSE BRANCH

Oneida, Ltd., was host to the Syracuse Branch at its December 5 meeting. The fifty-eight persons present at the dinner given in the company's sales office in Kenwood had spent the afternoon making a complete tour of the Sherrill plant. Mr. Daniel Gray gave a paper on the "Electropolishing of Silver in a Cyanide Solution" which gave an insight into the probable mechanism of the process, which is now being used at Sherrill. Mr. Gray pointed out possible ways toward further improvements.

The entire meeting was enthusiastically praised by all members present. Thanks were expressed to the entire staff at Oneida, especially to Mr. F. C. Mesle who arranged the meeting and to the speaker, Mr. Gray, and to Mr. David Clarin of Oakite Products who provided after-dinner entertainment by his skill as a magician.

M. P. Boland, Jr., *Secretary.*

TORONTO BRANCH

There were twenty-four members for the usual dinner preceding the meeting on December 12, and another thirty came in after dinner to hear the speaker.

The program committee had arranged for two color films—one of salmon fishing on the Pacific Coast and one of lobster fishing on the Atlantic Coast. We all enjoy these pleasant breaks from business and can recommend them highly to other branches.

Our speaker was Mr. Herbert Skelton of the John Inglis Company. He spoke on organic and inorganic finishing as well as plating. Because his company makes everything from fine fishing reels to vast glass-lined tanks for breweries, he had quite a field to cover; the talk was most interesting.

B. J. Cameron gave a financial report of the November dance: it was just as great a success financially as it had been socially. He was thanked by President Blandy for all the work he had done and

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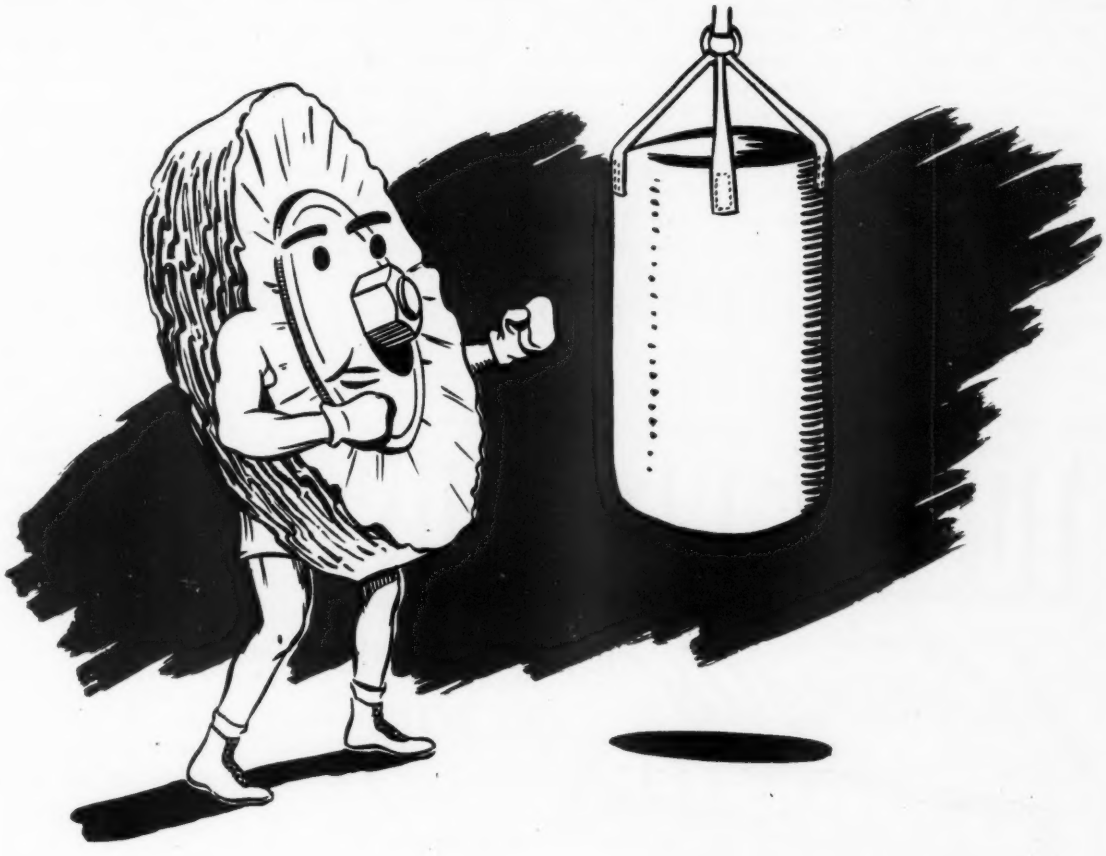
Codman makes RUGGED BUFFS



If you are looking for a buff that can take punishment—one that can give and take in the clinches—and come through every time, cool as a cucumber and still Champ—then you want the CODMAN *Ventilated NON-FRAY BUFF.

CODMAN'S "Rugged Buff" offers you long-run economy for high or low speed operation. Ruffled construction assures its long life and stamina. Patented ventilation features keep it cool under all loads.

You can meet this year-after-year winner by writing or wiring CODMAN—The Greatest Name in Buffs.

* Patent Nos. 2,027,863; 2,094,650
1,573,961; Re. 19,894; 2,140,208

BUFFING AND POLISHING WHEELS FOR EVERY OPERATION

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BRANCH OFFICES
DETROIT
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was presented with a smoking stand in appreciation. As usual he also won the draw for the prize of the evening, a very fine bait-casting reel donated by the John Inglis Company.

Announcement was made of completion of arrangements for the Regional Meeting, under the auspices of the Toronto Branch, to be held at the General Brock Hotel in Niagara Falls, Ontario, on May 15. Invitations to this meeting will be going forward to U. S. Branches in the vicinity. Due to Canada's shortage of U. S. funds it is very difficult for us to attend meetings in the States, but there is no such difficulty in the way of our U. S. members attending meetings in Canada. They will receive a warm welcome and, outside of the fact that we have arranged an excellent technical program, we can assure them of a better meal at a lower cost than would be possible in their own country.

KERGAN WELLS,
Review Correspondent.

TWIN CITY BRANCH

There were thirty-three persons present, including seven guests, at the meeting on December 1.

Through the courtesy of the Mine Safety Appliance Company, our speaker for the meeting was MR. GEORGE S. MICHAELSON, Acting Director of the Division of Public Health of the Minnesota Department of Health. Mr. Michaelson's informative talk dealt with "The Air We Breathe". Special emphasis was laid on the problems of ventilation in the metal finishing shop. Movies were shown in connection with this paper.

BOB BUCKLEY, *Secretary-Treasurer.*

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LEADING PLANTS REPORT:
GRIPMASTER BOOSTS POLISHERS' PRODUCTION AN AVERAGE OF 47% MORE PIECES PER HEAD!

Now! **Longer Wheel Head Life!** Thanks to Gripmaster's special high-heat resisting ingredient!

Now! **Fewer Stops for Wheel Changes!** Gripmaster *locks in* grains of emery "vise tight!"

Now! **Inventories Simplified!** One grade grips *all* grains—300 to 20. No special sizer needed!

Now! **Better Finishes!** Greater flexibility gives more and finer "breaks" when wheel is "cracked!"

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TWIN CITY BRANCH

Forty-two persons attended the meeting on January 5 at which PRESIDENT AL LEONARD had the pleasure of welcoming three new members.

The members were glad to see CLINT WALMAN, who had been confined to bed for the past thirteen months.

LIBRARIAN CLIFF BOWMAN introduced DR. MILLER, Technical Director of the Electric Coating Division of the Harper J. Ransburg Company, Indianapolis, who spoke on "Electrostatic Spraying and Detearing" and showed numerous slides illustrating his interesting talk.

BOB BUCKLEY, *Secretary-Treasurer*

WATERBURY BRANCH

MR. BERT DAW of Lasalco, Inc., St. Louis, Mo., was the featured speaker at the meeting on October 10. His talk on "Barrel Plating" was well illustrated by a new set of motion pictures portraying the action in a plating barrel with various types of work and different degrees of loading. The pictures showed very clearly the reason why overloading of the barrel causes poor plating.

Mr. Daw also showed some beautiful color film pictures of the Grand Canyon which he had taken on a recent trip. The coloring of the canyon walls and the sky was truly magnificent, and a number of well-taken shots from vantage points along the rim gave a very clear idea of the tremendous depth and the vastness of this remarkable river gorge.

MARTIN STERNFELS briefly reviewed some new developments of interest to platers: the satisfactory results obtained with glass blocks for plating tank linings, the production of larger contacting units for P. R. plating, and the Italian development of lead sulfamate baths using colloids from sulfite waste liquors.

At the meeting held on November 14, DR. GEORGE DUBPERNELL reviewed the A. E. S. Research Reports pertaining to adhesion of deposits, determination of impurities in plating solutions, and methods of stripping copper deposits. Martin Sternfels mentioned a method for producing chromium coatings developed in Germany during the war, in which ferro-chromium is reduced at high temperatures to form a ductile, acid-and-high-temperature-resistant coating on steel.

The Owens Corning Fiberglass Company provided a movie in technicolor showing the manufacture and use of fiberglass insulation.

MR. R. C. SCOTT of The Udylite Corporation, our speaker for the evening, chose for his subject, "Electroplating Current Control". He reviewed the sources of power for plating rooms, the methods used for control, and how they could be applied most economically and efficiently.

S. L. HENN, *Secretary.*

Editorial

Fedruary 1948

TRENDS IN PLATING BATHS

IN SERVING the metal working industry as a whole, is the plating industry meeting the repeated challenges of competitive materials such as stainless steel or plastics? He who looks for the answer in a revolutionary new process or method is certain to be disappointed. Chromium plating, which took its first stumbling steps some twenty-five years ago, was the last revolutionary development.

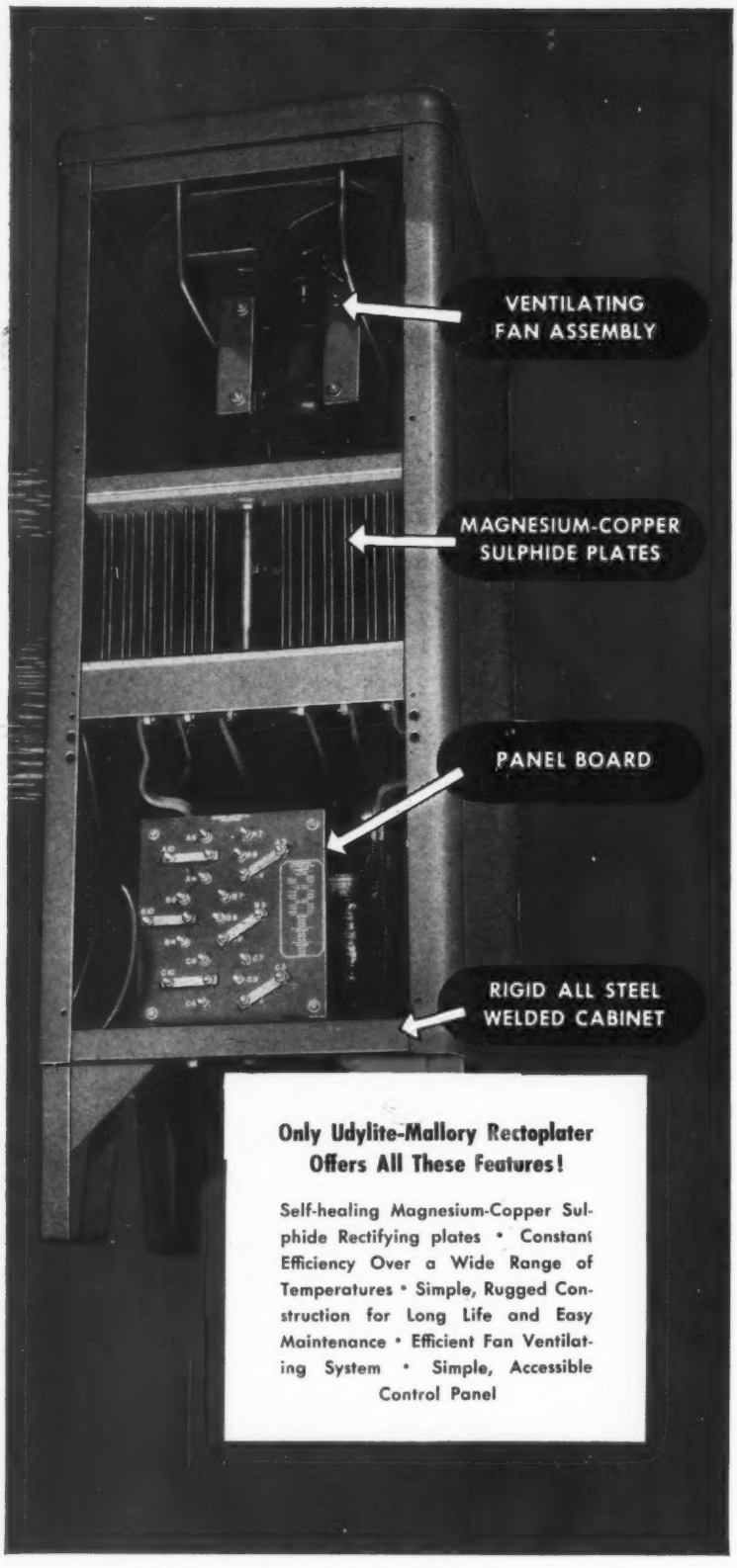
But a closer look will show that the plating industry is making every effort to improve its position. To take one example, a change of fundamental nature is taking place in the field of plating baths. This change has nothing to do with the occasional development of new types of solutions, however welcome they may be; rather, it is linked to the gradual evolution of old baths to make them fit new requirements for cost of plating and quality of deposit.

It is not very long ago that both the initial copper plate and the intermediate nickel plate had to be buffed prior to final chromium plating. Today those operations have disappeared in many applications by the development of baths which consistently give bright deposits. With efficient racks and rack coatings, parts pass from the cleaning process through the copper, nickel and chromium plating solutions without being touched. Where buffing still exists because it is cheaper to leave the base metal with a fairly rough finish, the work of buffing has been reduced by the development of baths which produce easily buffed deposits. Wider operating ranges have been accomplished by means of better addition agents and improved methods of bath purification, and the operating ranges have been moved toward higher current densities to reduce equipment and space charges.

The recognition of the importance of impurities, including the use of addition agents of relatively simple and known composition, is also an important step in the direction of higher quality. Very recently attention has been directed to the need for high ductility and low internal stress in the deposits, and the commercial plating baths are being reexamined for their ability to meet these new requirements. Those which do are finding increased acceptance.

It is striking that these developments almost without exception emanate from the plating supply houses, prodded, to be sure, by the large users of plating, especially the automotive industry. A general trend toward proprietary processes is the result. With more and more fundamental data becoming available, especially from the research activities of the American Electroplaters' Society, vital progress should become accelerated and the plating industry should continue to meet the challenges it encounters.

Gustaf Soderberg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A SYMPOSIUM

Plating on Zinc Base Alloy Die Castings

The continued strong interest in plating on zinc base alloy die castings prompts us again to devote an issue to this important subject. The reader is referred to the March 1947 issue of The Monthly Review for an earlier symposium.

The paper by Anderson and Reinhard included in this issue is an expanded treatment of the article by Anderson which appeared last March. Because of its significance it is printed in its entirety in spite of the repetitions which occur.

BURNS ± CALDWELL ± WAGNER
ANDERSON & REINHARD

Mr. Burns, who received a B.S. degree from University of Illinois in 1920, has for the last twenty years been engaged in sales engineering work for New Jersey Zinc Sales Company. His endeavors to raise die casting standards have gained him many friends, especially in the Middle West.

SOUND ZINC BASE ALLOY DIE CASTINGS

RALPH F. BURNS

New Jersey Zinc Sales Company, Chicago, Illinois

THE QUALITY OF DIE CASTINGS may be influenced by details of design in two important respects: soundness and mechanical properties, and character of the surface. Emphasis in the plater's mind is undoubtedly on a surface finish which requires very little preparation for finishing. The die casting foreman has another idea, the trimming foreman a third, and there probably never has been a Tennessee mountain feud waged with a bitterness of the struggle that is constantly going on between these three viewpoints. In this article it is hoped to present a new viewpoint that we think is of primary importance, that of the customer. In our opinion, the customer is thinking about strength and permanence first, and beauty second. He has designed his die casting and chosen his metal because of known or calculated engineering requirements. He has consulted handbooks and published specifications which describe the physical properties that he can expect from a die casting. He has bought and paid for them and is entitled to receive them.

Requirements

There are five elements which are essential in the production of sound die castings. The *first* element is "sincerity of purpose", an intelligent state of mind coupled with skill in the art of die casting and a determination not to compromise quality in any way at the expense of the customer's best interest.

The *second* element is the use of "on-grade alloys". These alloys only will give the customer the strength and permanence that he is paying for. Constant laboratory control of this important factor is essential.

The *third* element is good die casting design. The principles are not hard and fast or unvarying. There are some general rules which can be formulated and, if followed with judgment, they will go far toward realizing a design which is both logical and helpful in obtaining low cost. Although many of the rules may seem self-apparent, even experienced designers sometimes fail to heed the obvious. The electroplater does not always have a voice in the design of the die casting nor in the design of the die. But if he could make his influence favorably felt, he might save himself from many of the troublesome pitfalls in finishing. A few of these points are listed here.

1. A bead at the die parting minimizes somewhat the problem of removal of the flash and the scarring of the casting by tool marks. When beads are used for decorative purposes, it simplifies the buffing and polishing operations considerably to have the beads parallel to the length of the casting and in the plane of the buffing wheel. Care should be taken to avoid intersecting beads.

2. The ability to produce thin walls is one of the features of the die casting process; such walls not only reduce the weight of the casting but accelerate cooling which helps production of a smooth surface. The casting rate can be stepped up and some structural

strength gained because thin walls are stronger in proportion than thick ones. Ribs are sometimes necessary where wall thicknesses have been reduced; they should be so placed as not to complicate ejection and should be tapered gradually to blend in with the main section of the casting. Ribs also help in the filling of the die. Where bosses and similar heavy sections are used, they sometimes leave shallow depressions on the face of the casting which are known in the industry as "shadow marks." These marks are unsightly if the casting requires a lustrous finish; they can be minimized by making the changes in section as gradual as possible or by masking with ribs.

3. Sharp corners are always points of structural weakness, and fillets should be used wherever possible. Fillets as large as 0.030 inch probably would hardly be detectable by the naked eye, and on inside edges fillets as large as 0.060 inch are desirable. Other reasons for avoiding sharp corners are that buffing and polishing wheels usually cut through the metal at these points and organic finishes thin out on sharp corners and afford them poor protection.

4. Whenever possible, the use of plain flat surfaces should be avoided if plating is required. Such a surface magnifies any imperfection. Curved surfaces, beads, steps, or similar devices should be employed to avoid flat surfaces.

5. Care should be exercised in the location of significant areas to be sure that they can be reached by the buffing wheel. Deep recesses sometimes trap cleaning and buffing compounds, making the surface difficult to clean. Raised surfaces draw current preferentially and render it difficult to plate recessed surfaces. The use of generous radii make it possible to cover a casting with a minimum average plate thickness. Sharp outside edges should be avoided because plated coatings on such edges are usually rough and brittle. Deep concave areas are hard to plate and sometimes require special racks to raise the current density in the recesses. If it is possible to make significant areas convex, they are not as likely to reveal irregularities in surface.

The *fourth* element in a good sound die casting is good die design. This calls for great ingenuity and an intelligent practice of a very complicated art. Probably the first step is the selection of a die casting machine for the job, of a die block of proper size, of the pressures at which the job will be run, of the speed of the machine, the metal and die temperatures, and of the various controls. No one of these should put any limitations on the casting process. For example, the machine should be neither too big nor too small for the job. The size and the location of the gates and vents should be studied intensively. In this connection, an intelligent use of X-rays or the fluoroscope would be useful in minimizing porosity and when, in some cases, porosity cannot be completely removed, at least it can be directed to a portion of the casting which is not going to be mechanically stressed. Care should be exercised in providing proper heat distribution in the die by means of overflow wells, the size and the location of which are highly important. Anyone who has seen a die in the process of being broken in realizes that much cut-and-fit has gone into its preparation. All of these features—runners, gates, overflow wells—must be in balance because they have such an important bearing on the character of the surface.

The *fifth* element is good mechanical working order of the die casting equipment. The pressure should be positive, and there should be no pressure loss between the machine and the cavity. The controls should be accurate and functioning well.

To provide all of these five elements may sound like a large order, but assuredly not one of them can be neglected if the most is to be made of the die casting process. Soundness is dependent on these elements.

A Basic Research

Some of the early work by George Werley, reported in 1934 in the *Proceedings of the American Society for Testing Malerials*, is worth reviewing. Although it points the way to good die casting practice, for some reason it has never received the attention to which it is entitled. The work was done on test bars because the specimens had to be of a size suitable for laboratory testing, but the principles followed in the production of the test bars are exactly those which should govern the production of a commercial die casting. In 1932, Werley built an insert die for the casting of round and flat tensile bars and ¼ x ¼ inch impact bars. To make castings of this size and shape may appear a very simple matter. It would seem that the die should tolerate a gate of almost any size and at almost any location and still result in uniformity and permit endless reproduction. That very definitely was not the case; even under controlled casting conditions, the bars were very porous and there was a wide variation in the physical properties of the gate end and the vent end. The customer is buying both gate and vent ends of his casting, and, unless good die casting practice is the rule, his work may suffer similar variations in physical properties. Werley set out to improve this situation by making die changes in small individual steps and studying the effect of each change so that he would recognize the optimum condition when it was reached. When he started his work, the impact bar had a gate of 0.030 inch. This would seem to be an adequate size for almost any casting and almost any condition, but it is worthy of note that it was necessary to open up this gate to 0.083 inch or almost triple its original size before the

desired improvements were accomplished. The runner to the overflow well itself was tripled in size, and the overflow well was opened until it had a volume of 0.6 cubic inch. Similar opening of the gate in the tensile bar cavity was necessary before radiographs showed all the bars to be relatively free of porosity and impact values for the impact bars at the gate and vent ends had become uniform. Until these die changes had been made, the impact values for the gate end specimens were 38 foot-pounds and for the vent end specimens as low as 7 foot-pounds, an average of 21 foot-pounds; afterwards the impact strength reached a uniform value of 40 foot-pounds. Werley then applied the same principles to the improvement of a die which had been used years before in the production of specimens for the A. S. T. M. outdoor exposure racks: by opening up the impact bar cavity gate from 0.038 to 0.070 inch and adding a well of almost a cubic inch in content, porosity was again brought to a minimum and the impact values were made uniform and raised to a figure of 40 to 43 foot-pounds.

Principles

An analysis of the changes that Werley made will reveal the basic principles responsible for the improvements that were accomplished.

Through the gates and runners developed in the test bar dies, the metal travels by the shortest and most direct route to the cavity; it is kept moving until the cavity is filled; it enters as a solid stream; there has been no resistance to its flow and no constriction or bend in the runner which would have caused low physical properties and a poor surface. Since there has been no pressure loss and the metal has been allowed to wash through the cavity into the overflow well and stay molten while the full pressure is applied, solidification is able to proceed under the most ideal conditions. Run marks, cold shuts, chills, or whatever one chooses to call the common surface blemishes are all symptoms of irregular and nonuniform solidification. The polishing of the runner and the cavity have insured that there shall be no turbulence in the stream of metal as it enters the cavity. Sometimes a constricted gate along with high pressure brings about a velocity which causes the metal to enter the cavity as a spray, the particles of which never weld into the main stream and therefore bring about a surface defect that is difficult to remove by buffing. The waster cavities and wells are large and necessarily so. They have an important function to perform: they provide a port for the initial wash of metal into the cavity, and they perform at the same time their most important function of providing even heat distribution in the die which is so essential to the production of a good casting surface.

It is common practice in the die casting industry, in an effort to clear up run marks, to raise the metal temperature, speed the casting cycle, and fill with a fast shot because it is felt that cold shuts are the result of a cold die and that these means heat the die indirectly. This is not always the best approach to the problem; in reality it slows the casting cycle because, after all, the metal has to cool to the point where ejection is possible and, by running too hot a die, a defect sometimes results from soldering, burning, or pitting the die. In our opinion, a remedy for these conditions is to open the gate if at all possible; it is not always possible because obviously one cannot have a gate that is heavier than the section into which one is gating. Adding large overflow wells, speeding the casting cycle, and running the metal at nearly its freezing temperature bring about conditions which produce the problem of cooling the die instead of heating it.

To choose the location and the size of these gates is usually most difficult. It commands careful study by the die caster because if the first choice happens to be a wise one, a great deal of time is saved. A gate is faulty usually because it permits stoppage of the metal flow and solidification before the whole cavity has been filled and the pressure has been applied. Any delay in filling the die usually produces a bad surface. The best gates have a uniform cross-section and are so located that they do not direct the incoming stream of metal against a solid core or cavity wall which is likely to divide the stream; divided streams never rejoin perfectly within the cavity.

Under good die casting conditions, which include the use of heavy gates and heavy overflow wells, it is, as a rule, impossible to divorce good surface and good physical properties. The good physicals are what the customer has bought, and the good surface is what the plater is so eager for in order to hold his finishing cost to a minimum. The trimming foreman may object to the size of the gates, wells, and runners, and the casting foreman may not like the large amount of run-around metal but they must be looked upon as the price which must be paid for the necessary quality.

The art of die casting is a complicated one, and only by close attention to a long series of tiring details can the best results be expected. The customer is entitled to them.

RECENT DEVELOPMENTS IN THE FINISHING OF ZINC BASE ALLOY DIE CASTINGS

MAURICE R. CALDWELL

Jarvis Division, Doehler-Jarvis Corporation, Grand Rapids, Michigan

Graduated from Michigan State College in 1928 with a B.S. degree (electrochemistry major), Mr. Caldwell was employed with Dodge Brothers Division of Chrysler Corporation as analytical chemist on plating solutions 1928–1934 and with Yale and Towne Manufacturing Company, Detroit, in charge of plating operations 1934-1935. The latter year he joined W. B. Jarvis Company, now Jarvis Division of Doehler-Jarvis Corporation, as Plating Supervisor. He is now Assistant Vice-President of the Corporation. Mr. Caldwell is a Past President of the American Electroplaters' Society.

A MILESTONE IN THE finishing of zinc base die castings was passed during the years 1930–1933. Previous to this period, all castings were plated by using the well-known high-sodium sulfate nickel bath which made it possible to deposit nickel directly on the zinc alloy. Its two most outstanding disadvantages were slow rate of deposition making it impractical to deposit coatings thicker than 0.0002 to 0.0003 inch, and brittleness of the nickel deposit which made it subject to cracking under corrosive conditions.

Fig. 1 shows the coating on a 1932 automobile door handle.

The shift from straight nickel to copper-nickel was not made as if someone had suddenly made a new discovery. In fact, it was the only practical way to finish the ever-increasing quantities of castings.

Specifications

Even at this late date, the industry is not in agreement regarding the minimum depth of copper and the total depth of copper plus nickel required to withstand outside weather conditions.

In order to establish a minimum depth of copper, one must know the maximum thickness of copper that may become alloyed with the underlying zinc and then deposit possibly 0.0001 inch over and above this value. We have cut up many castings that had had from one to five years exposure; the maximum alloy thickness found is 0.00019 inch which is equivalent to 0.00006 inch of copper. The New Jersey Zinc Company re-

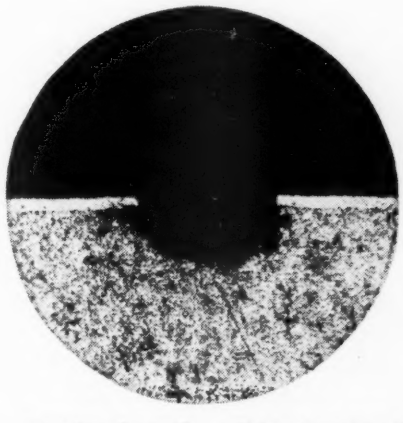

Fig. 1. Section through a 1932 door handle with 0.00013 inch thick nickel plate. 500X

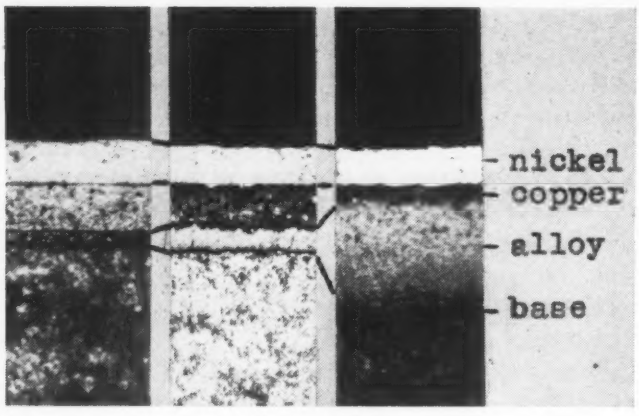

Fig. 2. Diffusion at 350° F after, from left to right, 4, 6 and 8 hours. 500X

cently stated that the maximum which they have ever found is 0.00021 inch of alloy equal to an original 0.00007 inch of copper.

The effect of exposure time at elevated temperature (350° F) is shown in Figs. 2 and 3. It will be noted that at the end of one hour, there is no measurable alloy thickness; this corresponds to the maximum produced on parts that are painted and baked. Our figures are higher than those reported by Castell[1] who states that the "rate of diffusion at normal temperatures is very slow and apparently does not affect the life of the protective deposit." Therefore, from this data, we fail to see any advantage in depositing more than 0.0002 inch of copper, 0.0001 inch for maximum diffusion and an extra 0.0001 inch for safety.

Parts subject to mild exposure would then require 0.0002 inch of copper and 0,0003 inch of nickel for a total of 0.0005 inch. However, parts subjected to severe exposure, such as outside automobile hardware, are being plated with a total depth of plate of 0.0008-0.0015 inch depending upon the part and the expected life.

In a recent report by the New Jersey Zinc Company[2] the observation was made that the worse failures of plated castings on automobiles seem to occur in large cities. Since the data from one such city—Chicago—indicates that the major part of the protection is afforded by the nickel layer, it would seem wise, for the present, to use as little copper and as much nickel as possible in building up the thickness.

The trunk hinges shown in Fig. 4 were on our roof for exactly one year. One can see why it is necessary to deposit at least 0.0008 to 0.001 inch total thickness. Generally speaking, the most important factor is depth of copper and nickel. While a certain part may have failed for one of a number of reasons, such as (1) porous base metal, (2) poor cleaning resulting in poor adhesion, (3) insoluble materials deposited with the copper or nickel, (4) impurities in the nickel

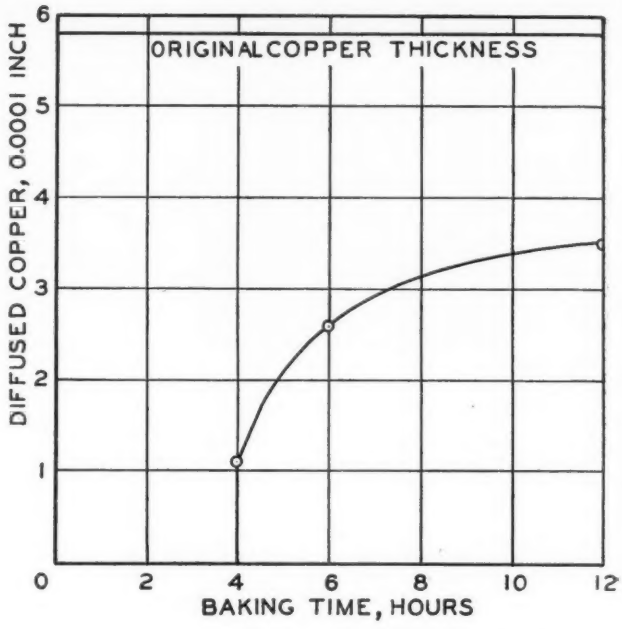

Fig. 3. Amount of copper diffused after heating at 350° F for varying time periods

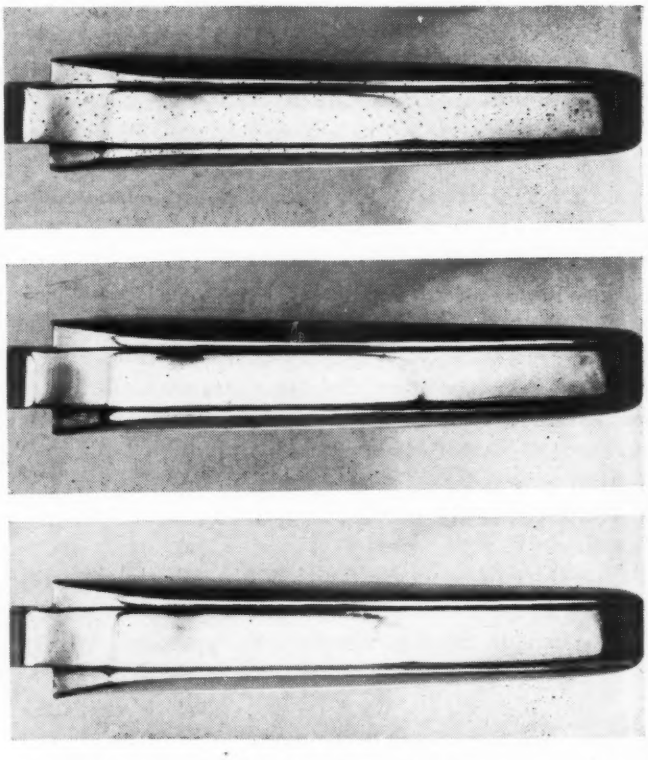

Fig. 4. Trunk hinges after outdoor exposure in Grand Rapids, Mich., for one year. Copper thicknesses, from top to bottom: 0.00015, 0.00035, and 0.00073 inch; total plate thicknesses, from top to bottom, 0.0004, 0.00095, and 0.00125 inch

deposit, or (5) low ductility of the nickel deposit, lack of plate thickness is still the outstanding and most glaring cause. This conclusion is based on many separate exposure tests which have been closely followed in order to determine the cause of failure.

Polishing and Buffing

That the die casting business has its problems is indicated by the fact that we all receive some castings with porous areas. Great strides have been made in die casting practice, however, and it is gratifying to note the high density of the metal in recent years. Even so, since we must finish some castings with porous sections, we set out some time ago to prove or disprove the advisability of polishing these sections. We also wanted to be brought up to date as to (1) the thickness of the surface skin, (2) the amount of metal removed by polishing with 180 grit on an oiled wheel, and (3) whether or not it is good practice to polish porous sections which have been scratched. The flat, thin-walled casting shown in Fig. 5 was selected for these tests partly because it was being received with considerable porosity and partly because it had a flat surface which would be suitable for measuring the amount of metal removed. Samples were prepared for both acetic acid salt spray and outside exposure tests with (1) no polishing or buffing, (2) normal buffing only, (3) normal polishing and buffing, and (4) removal of 0.005 inch followed by normal polishing and buffing.

Fig. 5 demonstrates the results of the acetic acid salt spray test after 48 hours. A noticeable improvement is observed as more metal had been removed. Thus far, the results of the outside exposure tests have agreed with those of the salt spray tests.

I do not wish to leave the impression that all porous castings would show such improvement by removal of metal. We happened to select the type of porosity that was shallow. Nevertheless, we have reason to believe that any casting with excessively porous sections will be improved by polishing which removes at least the fine shallow pores.

One might argue that one can never be certain that one will not cut into a larger number of pores on some castings. There are, of course, many types of porous castings and we have not examined all of them, but modern die casting methods with their high pressures, improved gating, and cooling of the die differ entirely from those encountered years ago when it was standard practice not to polish through the thin skin for

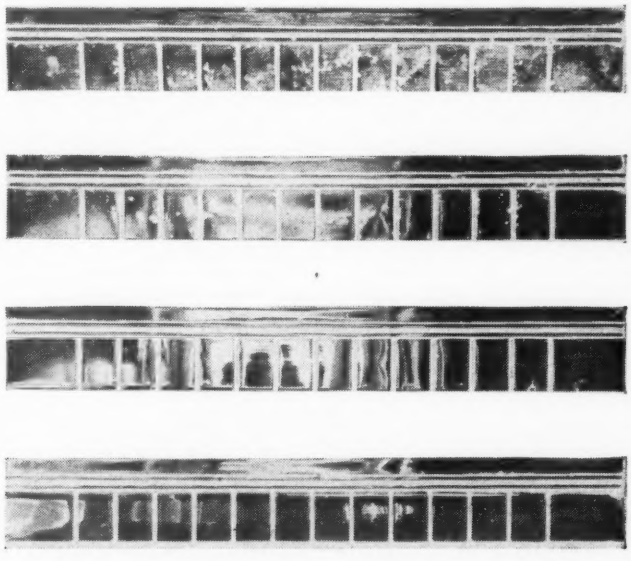

Fig. 5. Flat, thin-walled casting after 48 hours acetic acid salt spray test. From top to bottom: no polishing or buffing, normal buffing only, normal polishing and buffing, removal of 0.005 inch followed by normal polishing and buffing

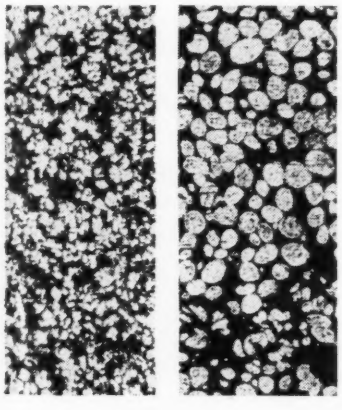

Fig. 6. Grain size at surface (left) and 0.375 inch below surface (right) of heavy-walled casting, a ¾ inch diameter door handle. 150X

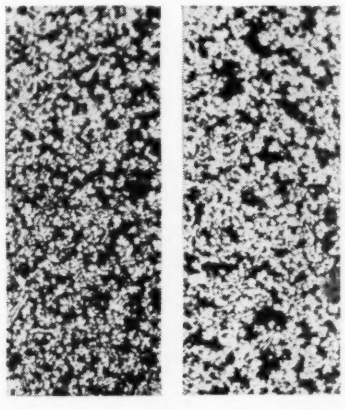

Fig. 7. Grain size at surface (left) and 0.030 inch below surface (right) of thin-walled (0.060 inch thick) casting. 150X

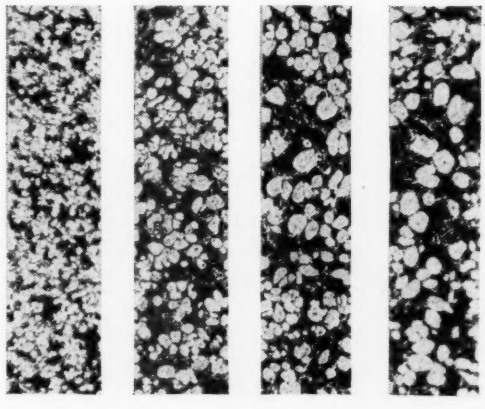

Fig. 8. Grain size at various depths below the surface of the casting in Fig. 5

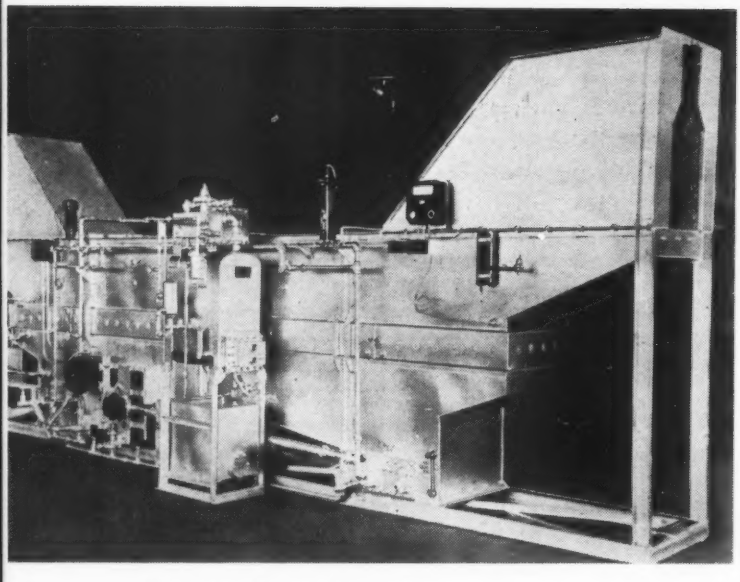

Fig. 10. Spray degreaser

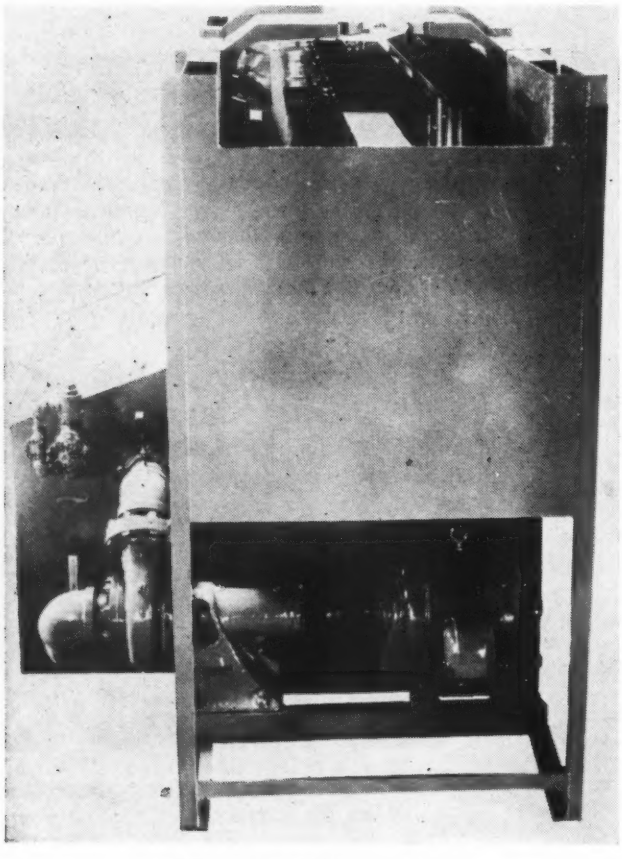

Fig. 11. Wash machine

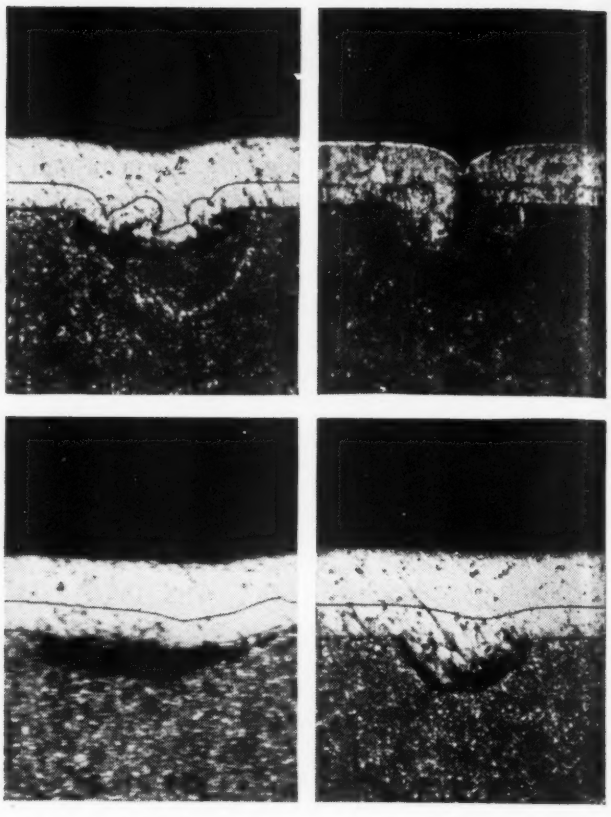

Fig. 9. Examples of plate on porous sections. 500X

fear of underlying porosity. The next few figures substantiate this reasoning.

Figs. 6 and 7 show the grain size at the surface and in the center of a heavy-walled and a thin-walled casting, respectively.

Fig. 8 shows the grain size of the casting used for the above mentioned polishing tests, ground to show the depth of skin. This casting could definitely be polished with removal of 0.010 inch of metal and still have a surface of small grain size. In fact, there was no other porosity throughout the section of this casting than at the surface.

The average amount of metal removed by polishing in ten tests was 0.0006 inch. Therefore, we feel that if any casting has porous sections, it will be improved by polishing. Because of the cost we naturally do not polish unless the appearance is poor or the corrosion resistance is low. Now that we know that polishing improves the quality after plating, we feel more justified in using it.

Cleaning Cycle

The four micrographs in Fig. 9 are interesting because they show the manner in which copper and nickel will bridge over small pores. They also demonstrate why platers are inclined to blame the well-known formation of blisters on bridging of pores. These blisters are formed by the expansion of trapped gases

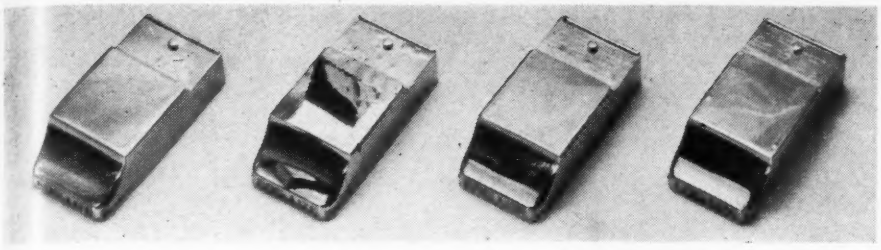

Fig. 12. Effect of anodic vs. cathodic cleaning on adhesion of copper-nickel plated parts after baking at 350° F for 4 hours. From left to right: first series, anodic and cathodic; second series, anodic and cathodic

or liquids either before or after baking. I do not propose to insinuate that the plater cannot reduce the tendency to blister. We know that anodic cleaning in properly formulated cleaners, good rinsing, acid dips with low rate of attack on the casting, and a well-balanced copper strike are necessary to reduce the percentage of rejects to a minimum.

The method of removing the heavy buffing compound from zinc base die castings is a common subject for discussion among platers. The two methods commonly employed are degreasing with trichlorethylene and use of emulsion cleaners.

Fig. 10 shows a modern spray degreaser. The work travels on a conveyor passing successively through vapor, spray, vapor, spray, and finally a vapor rinse. Under perfect conditions, the toughest job will be cleaned very well. However, precautions must be taken to filter and distill the solvent as well as screen the solvent going through the spray nozzles to prevent them from becoming plugged. Fig. 11 shows a typical wash machine which is used after soaking the parts in an emulsion cleaner.

Both methods have advantages; probably all shops that finish a great variety of shapes and designs should be equipped with both. It is, of course, preferable to eliminate degreasing if the emulsion cleaner will clean the part in question. A handling operation is saved plus the cost of operating the degreaser because the emulsion cleaning can be a part of the plating cycle with the parts on the plating racks. If the plating racks could be taken through the degreaser, the picture might change somewhat. This is being done to a limited extent but only with considerable expense in rack up-keep.

In 1940, Lewis [3] reported improvements by the use of anodic instead of cathodic electrocleaning and expressed the belief that the difference was due to elimination of hydrogen absorption. We wondered if this difference would be shown by a change in the depth of the diffusion layer, especially after baking. However, repeated tests did not indicate any such change, although the anodic method did produce a very great improvement in adhesion and lessened the development of blisters after baking as shown in Fig. 12.

Also, we have heard many reports advising against the use of silicates in the electrocleaning solution. The poor rinsing qualities of silicates have been demonstrated many times in our plant. A typical example of their detrimental effect is shown in Fig. 13. Notice the tear drop effect after bright copper and nickel plating! The gray streak will not be visible after nickel coloring but undoubtedly will result in poor adhesion.

The subject of chromium contamination of the electric cleaner was also studied. We wanted to know how detrimental chromium is and if we could remove it with sodium hydrosulfite and still obtain good cleaning. Using an anodically operated low silicate, high alkalinity type cleaner we obtained very encouraging results: even with as much as 1g/l of chromic acid we failed to make plates that were unsatisfactory. We also delayed making electrical contact for 30 seconds, which would be beyond the time required in any practice, with equally good results; in fact, it looks worthwhile to investigate further to see if there might have been some advantage. To complete the experiments, we added enough sodium hydrosulfite to reduce the chromate and made additional plates: they showed good adhesion both before and after baking.

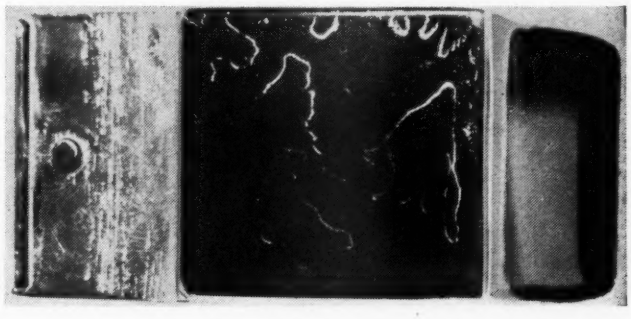

Fig. 13. Tear drop effect through bright copper-nickel plate caused by incomplete removal of silicate cleaner during rinsing

Copper Flashing

We are advised to use a well-balanced copper strike in order to obtain good adhesion of the copper. But what is a well-balanced strike? We have studied all the variables and have reached some very definite conclusions:

First, the copper content was varied from 1.0 to 4.0 oz/gal, with the sodium cyanide at 1.0 oz/gal and

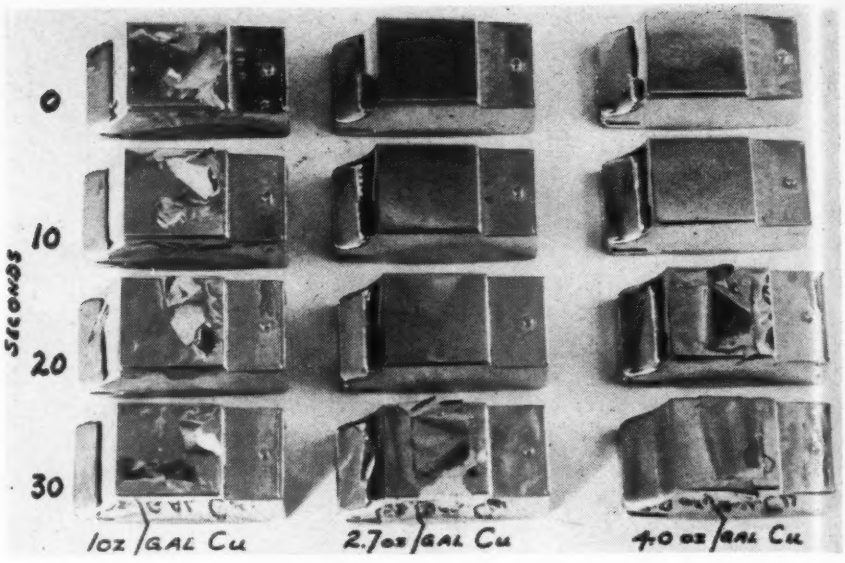

Fig. 14. Effects of copper concentration in copper strike and time in solution before contact is made. Samples baked at 350° F for 6 hours

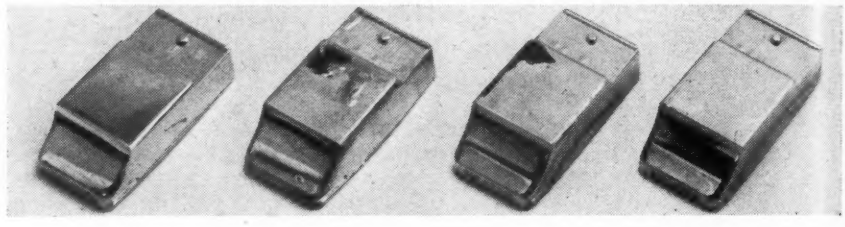

Fig. 15. Effect of hexavalent chromium in copper strike. From left to right: 0.038, 0.114, 0.266 g/l chromium, 0.266 g/l chromium plus 0.684 g/l sodium hydrosulfite. Castings baked at 350° F for 6 hours

the sodium carbonate at 2.0 oz/gal. Plates were made with immediate contact and up to 30 seconds' delay. Fig. 14 demonstrates the results. The blisters were not noticeable until after baking. From these tests, we believe a copper content of approximately 1.75 oz/gal to be the best.

Second, we varied the sodium carbonate from 0 to 12 oz/gal. For each step, contact was delayed for various time intervals up to 30 seconds. The adhesion was good on all pieces with up to 2 oz/gal, including those which received a 20- and 30-second delayed contact. With 6 oz/gal, adhesion was good except on those specimens receiving a 30-second delayed contact. With 12 oz/gal, the adhesion was good on all pieces except those receiving a 20- and 30-second delayed contact. These results were found after the parts had been baked at 350° F for 6 hours. The adhesion was observed after cutting up the parts and attempting to break away the deposit. Blistering after baking was not prevalent in any case.

Third, we studied the effect of *p*H in the copper strike. The *p*H range was from 9.0 to 13.0 measured with a Beckman meter with a type E, high *p*H electrode. When the die cast part did not make electrical contact, the rate of formation of immersion deposit decreased as the *p*H was increased. The tendency of the plated coating to blister was greater with the higher *p*H even without baking. At a *p*H of 13.0, the copper was blistered as it came out of the High-Speed bath which followed the strike. We concluded, therefore, that a *p*H higher than 12.0 was not desirable. A *p*H lower than 11.0 is undesirable because of the low anode efficiency which would make it difficult to maintain the copper content and the bath efficiency.

Finally, having observed poor adhesion and blistering in some production tanks, we studied the effect of hexavalent chromium contamination in the strike. Fig. 15 shows some of the results obtained after six hours baking at 350° F. With 0.038 g/l chromium the deposits appeared good—no blisters and high adhesion. Definite blistering occurred with 0.114 g/l and, with 0.266 g/l, the deposit had practically no adhesion. The subsequent addition of sodium hydrosulfite ($Na_2S_2O_4$) in amounts equal to $2\frac{1}{2}$ times the weight of chromium brought the deposits back to normal. This result is very important due to the fact that most platers desire to use the same racks for copper, nickel, and chromium. Chromium contamination is inevitable, but can be controlled.

Acknowledgment

I wish to acknowledge the assistance of Messrs. Keith E. Yhouse and Jacob M. Hage of our technical staff, whose efforts made it possible to compile this report.

LITERATURE CITED

[1] Wilhelm F. Castell, "A Study of Diffusion on Copper-Plated Zinc Base Die Castings", *Trans. Electrochem. Soc.* **66**, 427 (1934).

[2] E. A. Anderson and C. E. Reinhard, "The Causes of Failure of Plated Zinc Alloy Die Castings in Automotive Service". The New Jersey Zinc Company of Pa., October 1, 1946; this issue.

[3] B. F. Lewis, "The Relationship of Cleaning Techniques and Adhesion of Electrodeposits". *Proc. Am. Electroplaters' Soc.* **28**, 64 (1940).

A graduate of Purdue University in 1928 with B.S. degree in chemical engineering, Mr. Wagner has served with Guide Lamp Division for over nineteen years as Chemist, Foreman, Supervisor of Plating, Assistant Superintendent, and Superintendent of Manufacturing Processes. The A. E. S. Proctor Award in 1938 and its Fifty Dollar prize in 1941 testify to his contritions to the plating industry.

PLATING OF ZINC BASE ALLOY DIE CASTINGS

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A SATISFACTORY PLATE on a die casting might be described as one which is adherent, protective and lustrous under the exposure conditions and for the period of time required for the particular application. It is generally recognized that the life of a plated coating is in inverse proportion to the severity of exposure conditions. Die castings plated for indoor use are not usually exposed to corrosive atmospheres or conditions and are therefore generally less subject to failure.

This discussion relates principally to the plating of die castings for exterior automotive use and is based upon the methods and processes in use by the Guide Lamp Division of General Motors Corporation whose products fall in this classification. Generalizations regarding requirements for adequate protection have been given support by the comments of several outstanding plating experts whose opinions have been solicited in advance of preparation of this paper.

Assuming that adhesion, protective properties and appearance are the qualities to be achieved in die cast plating, it may be well to discuss the subject under these general headings.

Adhesion

It is axiomatic that a plate, however dense, thick, or lustrous, is of no value if it does not adhere to the base metal. Therefore, the first important task is to make the plate stick. The solution of this problem depends to a large extent on the processes preceding actual plating, such as alloying and casting practice, polishing, and cleaning.

Regarding *alloy composition*, it has been learned through repeated bitter experience that appreciable amounts of lead or tin in die castings will cause blistering, sometimes in the tank. It is true that the amounts required to produce blistering are materially in excess of the maxima specified for good castings, but it is unfortunately also true that alloys with such excesses occasionally do reach the plating department. It has also been demonstrated that intergranular corsion, which occurs after the plate has been penetrated, results in more noticeable blistering in shorter time than does normal corrosion. This intergranular corrosion is due to excessive lead and, possibly, tin or cadmium, and low magnesium.

Poor casting practice, which results in cold shuts, folds, porosity, or other conditions necessitating extensive polishing, can lead to non-adherent plate due to inclusions of polishing compounds, gases, or solutions. Excessive polishing which penetrates the dense die cast skin to expose a more porous surface also can result in poor adhesion. Likewise, buffing may tend to close cold shuts or porous areas which then become traps for foreign materials under the plate.

Failure to remove polishing compounds completely will cause poor adhesion and this, of course, must be taken care of in the *precleaning* cycle. Our precleaning is done on a chain conveyor which carries the racked

work from the buffing department to the plating department. Since soaking, because of the long time required, would use an uneconomically large volume of solution, we use sprays exclusively. An unstable emulsion type spray in the first stage is followed by mild alkaline sprays and rinses. Others successfully use soak type emulsion or solvent precleaning or trichlorethylene degreasing with soaking, spraying, and vapor condensation.

Electrocleaning, in our opinion, is more a preparatory surface treatment than an actual cleaning operation, for it is well known that very little soil is removed in the electrocleaners usually employed on die castings.

It has been demonstrated in the past that a heavy diffusion layer at the juncture of the copper plate and the die casting will tend to result in poor adhesion. While the thickness of this diffusion layer depends upon the temperatures to which the die casting has been exposed after plating, its growth under normal outdoor exposure conditions is importantly influenced by the method of surface preparation prior to plating.

It has been our experience that anodic cleaning followed by an extremely mild acid dip results in the best adhesion. With anodic current, the chromium contamination introduced from racks which pass uninterruptedly through the copper-nickel-chromium cycle is not harmful and shows an adverse effect only if drying occurs on transfer from the cleaner to the rinse; there is no deposition of zinc in the cleaner, and no evolution of hydrogen which might be occluded in the castings. Since our work is done on automatic plating conveyors with a fixed transfer time, our cleaners, to avoid drying, are operated at somewhat lower temperatures than might otherwise be used.

A proprietary cleaner containing pyrophosphates is employed with anodic current for about one minute at a temperature of 150° to 155° F. The parts emerge slightly darkened with most of their original luster. We have used successfully several different cleaners, but the present one has the longer life, requiring fewer shutdowns for changing. Others have reported good results with specification cleaners made from simple alkalies.

Following through rinsing, parts pass for about 20 seconds through a dip of approximately 0.25 per cent *sulfuric acid* which is constantly overflowed and recirculated to keep the surface free from oil. Time and concentration are so adjusted that the parts are removed from the dip precisely when the first indication of gassing appears. By carefully controlling this balance, the anodic film formed in the cleaner is not destroyed, and the practical absence of evolved hydrogen precludes absorption of that gas and the blistering it may cause.

The parts are rinsed and given a *copper strike* for 20 to 30 seconds in a conventional strike bath containing Rochelle Salts at 140° F and are then ready for copper plate. Immediate covering in the strike is noted as the reducing action of the cyanide plus electrodeposition instantaneously replaces the anodic film with copper being deposited on a fresh, active die cast metal surface.

It is interesting to note that, when examined by Anderson and Reinhard (THIS ISSUE), die castings which had been processed through the treatment cycle described here showed diffusion layers ranging from zero to 0.00003 inch in thickness with adhesion generally good after five years service, while others processed through other cycles had diffusion layers as thick as 0.00021 inch and less satisfactory adhesion.

PROTECTIVE PROPERTIES

Results of many tests in recent years point out conclusively that the most important single factor affecting the service life of a plated die casting is thickness of plate. The Anderson-Reinhard report indicates that for "perfect" protection for a period of five years outdoor exposure a minimum thickness of 0.0015 inch is required in the cities studied. However, properly applied 0.0010–0.0012 inch thick coatings show a generally satisfactory, though not perfect appearance. Furthermore, if we assume that protection for a lesser period of, say, three years is all that is required, the 0.001 inch minimum thickness will probably be adequate again. More work over an extended period of time will be required to determine this accurately.

It is the writer's firm belief that if all manufacturers of plated die castings for outdoor exposure would scrupulously adhere to an absolute *minimum* specification of 0.0010 inch of copper plus nickel and apply it to properly made and prepared on-grade casting, generally satisfactory performance would result. It should be emphasized that we are speaking of *minimum* thickness on significant areas which receive the *least* amount of plate. These areas will have to be determined for each individual part. Tests on a considerable number of parts produced by manufacturers who believe they are now meeting this specification have revealed shocking nonconformity.

Of course, varying exposure conditions in different localities, including presence of acids or chlorides in the atmosphere or on streets or roads, and the care taken of the part by the owner are important factors in the life of plated castings. The beneficial effect of occasional wiping with a light oil has been pointed out in the past. Unfortunately, these are factors that cannot be controlled from the plating room.

Since the need for heavier coatings has been at least partially recognized in recent years, it has been necessary to apply copper in order to deposit thereon a nickel that would not display brittleness when plated

thick enough to meet requirements. Early work, which showed that copper tends to diffuse into zinc base die castings, led to the rather generally accepted minimum copper thickness specification of 0.0002 inch. Later investigators demonstrated that diffusion proceeds rather slowly except at elevated temperatures and drew the inference that the minimum copper thickness required might well be only that over which low *p*H nickel could be applied practically. This was welcome news to platers since, with the copper solutions then available, it was difficult to plate 0.0002 inch copper without having to buff it. Subsequent developments in copper plating have, however, practically eliminated this difficulty, and the generally accepted practice today is to deposit a minimum of 0.0003 inch copper.

Considerable work was done just prior to the late war toward increasing the copper thickness and decreasing the nickel thickness correspondingly to conserve nickel and to decrease total cost of metal plated. The relative merits of heavy copper and heavy nickel have since been discussed extensively without any too satisfactory conclusions being reached. For die castings, general opinion currently remains in favor of the greater portion of the plate being nickel; this is based on the belief that failures are ordinarily caused by corrosive attack on the outer surface of the plate and penetration to the base metal. If this be true, the plate which best resists the corrosive media should comprise the major part of the total plate. Results of the Anderson-Reinhard tests indicate that nickel has been more effective than copper in providing protection in the Chicago area. It is possible that this will vary according to the atmospheres in different localities.

There is a widespread misconception regarding the role of chromium in decorative plating. Most persons in the trade are aware that heavier *total* plate thicknesses offer greater protection, and hence some are inclined to apply the same thickness criterion to chromium. That, however, is a false assumption. Electrodeposited chromium is quite porous; within the thickness range practical for decorative work, its function is purely to impart a blue-white, tarnish resisting surface to the protective plate beneath, and it does not in itself provide any additional protection to the base metal. On the contrary, chromium of thicknesses of the order of 0.000030 inch or more have a definitely deleterious effect, actually causing the plate to crack on prolonged exposure, particularly in environments where chlorides or acids are present.

This is largely due to the fact that chromium deposits are highly stressed and exert these stresses on the underlying plate, tending to pull the plate from the base metal. Corrosion proceeds more rapidly along stress lines, and in corrosive atmospheres these lines become etched in the chrome plate, causing attack on and cracking of the nickel beneath. The stresses—and resultant cracks—increase with the chromium thickness. Since the thickness is greater at high current density points, the cracks are usually more evident at such points.

Recognizing that a chromium thickness barely sufficient to cover the nickel would be ideal but that some minimum must be specified to resist the abrasion of wiping or polishing with which a few owners still favor their cars, General Motors a few years ago reduced its chromium specifications from 0.000025 to 0.000010 inch minimum for all classes of plate. This 0.000010 inch minimum is part of A. S. T. M. specifications and is favored by most authorities, some of whom also advocate a *maximum* limit of 0.000025 inch. Except for practical difficulties in production, we would unhesitatingly join this latter group.

Summarizing, our aim is to deposit minimum thicknesses of 0.0003 inch copper, 0.0005 inch nickel, 0.0010 inch copper plus nickel, and 0.000010 inch chromium. This we do in full automatic plating conveyors through a cycle, part of which has been described in our remarks on adhesion.

Following the copper strike, parts are transferred directly into the cyanide *copper plating* solution which is a proprietary high concentration bath containing organic addition agents. Careful control of composition and temperature, adequate filtration, and agitation by means of solution circulation permit deposition of a smooth, bright plate in excess of the 0.0003 inch minimum in about 16 minutes. The simultaneous processing of literally scores of differently shaped parts and the normally weird shape of die cast parts make meaningless any reference to current density. Actual control of current is accomplished by balancing of areas and arranging parts on racks to best advantage and then determining by experience the voltage which will insure that minimum thickness requirements are met on all parts. Anode replacement, both in the copper and the nickel tank, as well as brightener additions to the latter are based on ampere-hour data.

A *reclaim* tank is next. Automatic level controls on the copper bath causes the reclaim solution to be pumped back into the plating tank as required. The reclaim tank level is maintained manually by addition of softened water, since use of the hard water in our locality contributes to roughness of copper plate and increases the content of carbonates which are detrimental in high concentrations.

Following a rinse is a mild *anodic cleaner* which removes any adherent solution film. It is possible, by means of careful rinsing, to eliminate this step, but limitations in our conveyor cycle indicate its desirability. Another rinse is followed by a brief dip in a 3 per cent *sulfuric acid* solution containing a small amount of wetting agent. The work is then transferred directly into the nickel tank. An intervening rinse is

not necessary since drag-in of acid is no higher than is required to maintain the *p*H.

Commercial *bright nickel* solutions are used, having a nominal chemical composition as follows:

Metallic Nickel	9.5 oz/gal
Chlorides (as Cl)	2.7 oz/gal
Boric acid	6.0 oz/gal
Addition agents	as required
Temperature	130° F
*p*H	3.0

Nickel thickness is in accordance with specifications, being simply a matter of using the proper amount of current since the 25 minutes time in the bath would permit deposition of considerably more. Automatic level controllers cause pumping from the subsequent reclaim tank, which is manually filled from the city water line. De-ionized water would be desirable here because accumulation of calcium sulfate in the nickel bath will eventually cause roughness. Continuous filtration is essential. Bath temperature is maintained by use of external heat exchangers.

Following another rinse, the parts are transferred directly into the *chromium* bath which contains 40 oz/gal chromic acid with a sulfate ratio of 90:1 and is operated at 125° F. Heating and cooling are accomplished by means of external heat exchangers with steam and water valves operated by temperature controllers. Since excessive accumulation of iron in this bath increases resistivity and causes serious loss of throwing power, duriron piping in the heat exchangers is preferable to black iron. A reclaim rinse, cold dip rinse, spray rinse, final rinse of steam condensate from heat exchangers and heating coils, followed by a cold and hot blast dryer complete the cycle. A relatively small per cent of the parts require chrome coloring.

The foregoing sequence will produce satisfactorily plated die castings provided all specified conditions are met, baths are kept in good operating condition, and mechanical maintenance of the conveyors is such as to prevent breakdowns. The plate, of course, must be dense and continuous. There is little chance for pitting in these copper or nickel baths if specified minimum wetting agent concentrations are maintained and contamination is avoided. The adequate precleaning should insure against failure due to adhering solids. However, ample and efficient filtration must be provided to keep plating solutions free from suspended foreign particles which will cause roughness and frequently a lack of continuity of the plate. The desirable rate of filtration in both copper and nickel baths is generally considered to be at least 25 to 50 per cent of the bath volume per hour, and pumps should be kept in condition to prevent air being injected into the plating baths.

Appearance

The final requirement for a good plate on die castings is that it must be lustrous. This presents no great problem with modern bright plating solutions provided they are maintained to specifications and kept free from impurities. The copper deposit, if smooth and fine-grained, need not be fully bright in order to provide a satisfactory base for bright nickel, particularly if the nickel thickness is kept up to or above the specified amounts mentioned earlier. Tanks must be raked frequently and thoroughly to avoid contamination from dissolving die cast parts, and racks must be carefully maintained to minimize loss of parts and solution carry-over in pockets caused by breaks in the rack coating. Rinses should be agitated and overflowing in all cases.

When these conditions are maintained, metallic contamination rarely is a significant factor since continuous electrolytic removal of copper and zinc is automatically provided by plating on the low current density areas of the recessed inside portions of many die castings. However, since organic contamination in the copper or nickel baths can cause brittleness and loss of lustre, periodic purification by adsorption and filtration is necessary. Frequency of treatment will vary with factory conditions and the sensitivity of the solutions employed but is usually necessary after several months of operation. Regular Hull Cell panel tests on the baths will give a reliable indication of the need for purification.

Acknowledgment

The author wishes to acknowledge with thanks the courtesy and cooperation of the following persons in freely expressing their requested opinions on several matters discussed herein prior to the preparation of this paper: Mr. W. L. Pinner, Houdaille-Hershey Corporation; Mr. M. R. Caldwell, Doehler-Jarvis Corporation; Mr. D. M. Overcash, Brown-Lipe-Chapin Division, General Motors Corporation; Mr. E. A. Anderson, New Jersey Zinc Company; Mr. C. E. Heussner, Chrysler Corporation; Mr. C. F. Nixon, Fisher Body-Ternstedt Division, General Motors Corporation; and Mr. R. W. Oyler, Guide Lamp Division, General Motors Corporation.

CAUSES OF FAILURE OF PLATED COATINGS IN AUTOMOTIVE SERVICE

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Mr. Anderson, Yale Ph.B. in mining 1920 and M.S. in metallurgy 1923, joined New Jersey Zinc Research Division in 1923 and is now Chief of its Metal Section. His society activities have been centered in Committees B-3 and B-8 of A. S. T. M., A. E. S. Research Committee, and A. I. M. E., of which he is a Director and Chairman of the Institute of Metals Division. The Institute of Metals Division Award in 1935, the A. E. S. Gold Medal in 1947, and its Fifty Dollar prize in 1940 (with C. E. Reinhard) are among the honors awarded him.

Mr. Reinhard entered the employ of New Jersey Zinc in its Plating Laboratory in 1927 after having graduated from Cornell University with an A.B. degree in chemistry. He has been active in A. S. T. M. work, especially in the corrosion testing of Committee A-5. Author of numerous papers on plating, surface treatment and corrosion of zinc, he received A. E. S. Fifty Dollar prize (with E. A. Anderson) in 1940.

MANY DATA HAVE BEEN published relating the rate of failure of plated panels to thickness of coating and other variables. These data have been obtained in continuous exposure tests such as those conducted by the Research Committee of the American Electroplaters' Society. Valuable as the results of such tests have been, they have left unanswered many questions regarding service performance. The panels generally were prepared on a laboratory basis using controls not always feasible in commercial practice. The exposures did not include such variables of service as contact with mud, calcium chloride, and other materials found on the street. Care usually was taken to avoid altering the natural surface during exposure whereas service conditions include contact with perspiration, rubbing with metal polish, and coating with waxes and oils. Exposure tests generally are continuous while service, as with automobiles, includes some time under shelter.

It seemed to the writers that much useful information might be gained from a careful examination of plated parts which had failed in normal automotive service. Accordingly, seventy-one plated zinc alloy die cast parts were collected, mostly from 1941-model cars, which had had about five years of use. Most of the parts were obtained in Chicago, Ill., but a sufficient number were selected in Detroit, Mich., New York City, and Palmerton, Pa., to permit a fair comparison of atmospheric environments.

Inspection Methods

The parts selected included every outside die cast part except the radiator grille and were taken from

twenty different cars covering the standard price range. All of the Chicago, New York, and Palmerton cars were in the hands of the original owners, and all of the parts were identified as original equipment. Information is lacking on the Detroit cars.

Inspection of the parts when received showed that virtually every piece had failed in some degree by the raising of corrosion blisters in the plate. As would be anticipated, the degree of coating failure varied over the surfaces of the pieces, being greatest in the areas expected to be thinly coated and least in the areas expected to be thickly coated. These variations in performance required the examination of more than one area on a part in most, but not all, cases. In all, one hundred and thirty-two areas were examined, representing expected maximum, minimum, and approximately average thickness points.

At the outset, it was desired to place the degree of plate failure on a numerical basis since it was anticipated that plotting of the data would be instructive. To accomplish this, gradations were selected between perfect performance, rated 1, and the worst observe failure, rated 7. The conditions corresponding to each numerical value are shown in Fig. 1. It was not considered necessary to photograph the perfect condition corresponding to rating 1.

The condition of the plate in the selected areas on each casting was rated by this scheme with a probable accuracy of $\pm \frac{1}{2}$ unit. A microsection was then cut in each such area and was used to determine the coating thickness by direct measurement at 1000 magnification. Such measurements have a probable error of ± 10 per cent of the thickness.

The sawed edge left in removing the microspecimen afforded an opportunity to determine the coating adhesion by the knife test. Where the coating could be removed quite readily by this means, the adhesion was classified as poor. Where the coating could be lifted only with great difficulty or not at all, the adhesion was classified as good. More subtle distinctions might have been made, but it was realized that the knife test has inherent limitations which would reduce the value of close distinctions. More delicate comparisons would require a better adhesion test than is now available.

The one hundred and thirty-two microspecimens furnished an opportunity to examine the coatings for evidence leading to a better understanding of the mechanism of failure. Analyses were made of certain of the castings to detect possible relationships between alloy composition and plate performance.

The available data are compiled in Table I.

Coating Thickness

The corrosion rating versus coating thickness data for the selected areas on the parts from the four cities have been plotted in Fig. 2 using an inverted scale to place best performance at the top of the charts. The solid circles represent coatings having good adhesion while the open circles are for the coatings having poor adhesion. Certain points otherwise marked will be discussed below. On each plot, a trend line has been drawn to indicate the direction of the observed effects of coating thickness. These lines are not intended to represent average performance.

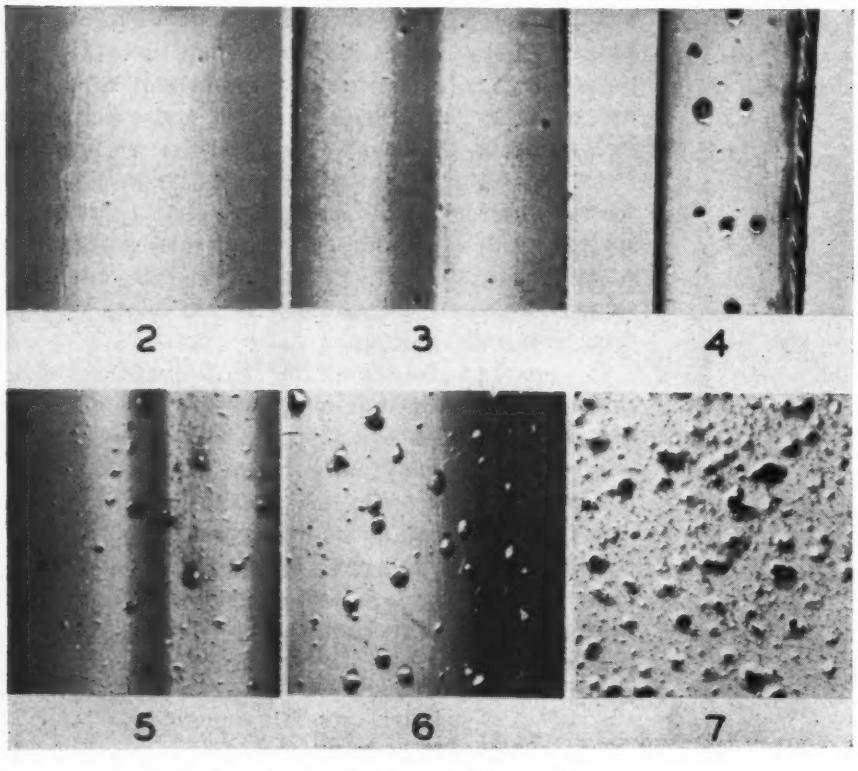


Fig. 1. Corrosion rating key. Full scale

At the outset, a simple inspection of the charts reveals a direct correlation between total coating thickness and corrosion rating, with the heavier coatings giving the better service. *This relationship is more important than any other factor in deciding service performance. Increased thickness of coating can compensate for other deficiencies, but there is no way of compensating for insufficient thickness.* Only 50 per cent of the parts examined exceeded 0.00075 inch in their

TABLE I. THICKNESS OF COATING, CORROSION RATINGS, COATING ADHESION AND DIE CASTING ANALYSES OF AUTOMOTIVE HARDWARE

Car	Model	City	Part	Thickness of Coating in 0.00001 inch							Alloy Analysis		
				Diffusion Layer	Cu	Ni	Cr	Total (a)	Rating	Adhesion (b)	Mg	Pb	Cd
1	1941	Chicago	A—Fender ornament	3	5	60	1	67	4	G	*	*	*
				4	5	67	<1	74	6	G			
				3	7	72	<1	81	4	G			
			B—Parking light	1	59	128	8	195	1	P			
				<1	28	58	1	87	5	P			
				†	82	61	<1	144	2	G			
				†	137	148	5	290	1	G			
			C—Turn light	3	73	92	4	170	1	P			
				2	82	89	3	174	5	P			
			D—Door handle	5	24	97	1	123	4	P			
				10	13	47	<1	63	6	P			
2	1939	Palmerton	A—Grille strip	<1	14	39	<1	54	6	G	*	*	*
			B—Hood molding	1	6	31	<1	38	4	G			
				2	4	20	<1	25	5	G			
			C—Hood molding	1	11	45	<1	57	2	G	*	*	*
				2	60	30	<1	91	1	G			
			D—Emblem	1	16	58	<1	75	1	G			
3	1941	Palmerton	A—Lamp body	2	48	53	<1	102	1	G			
				1	41	123	<1	165	1	G			
				3	27	22	<1	51	6	G			
				1	35	55	<1	91	2	G			
5	1940	New York	A—Door handle	<1	44	71	1	116	1	G			
				<1	35	29	<1	65	5	G			
6	1941	New York	A—Door handle	14	15	114	1	133	1	P			
				14	9	51	<1	63	3	P			
7	1939	New York	A—Door handle	2	50	130	2	182	1	P			
				2	32	71	<1	104	2	P			
8	1941	New York	A—Door handle	15	20	96	<1	121	1	P			
				14	14	59	<1	77	2	P			
9	1941	New York	A—Fender ornament	<1	8	152	1	161	1	P			
				<1	8	104	<1	113	2	P			
				<1	6	87	<1	94	2	G			
			B—Door handle	11	25	106	<1	135	2	P			
				13	12	52	<1	68	4	P			
10	1941	Chicago	A—Hood louvre	5	17	36	4	58	6	G			
			B—Hood louvre	3	24	46	<1	72	6	G			
			C—Lamp bezel	3	29	78	<1	109	7	G	0.017	0.02	0.007
			D—Lamp bezel	<1	22	81	1	104	7	G	0.018	0.02	0.0075
			E—Lamp bracket	2	36	75	<1	112	2	G			
				1	41	31	<1	73	7	G			
			F—Lamp bracket	1	41	70	<1	112	3	G			
				<1	21	28	<1	50	7	G			
			G—Fender ornament	2	45	40	<1	86	7	G			
			H—Fender ornament	1	38	54	<1	93	6	G			
			I—Fender ornament	2	37	25	<1	63	7	G			

(*Continued next page*)

Car	Model	City	Part	Thickness of Coating in 0.00001 inch							Alloy Analysis		
				Diffusion Layer	Cu	Ni	Cr	Total (a)	Rating	Adhesion (b)	Mg	Pb	Cd
			J—Fender ornament	1	40	43	<1	84	7	G			
			K—Fender ornament	<1	51	52	<1	104	7	G	0.045	0.0075	0.0013
			L—Fender	1	41	88	<1	130	2	G			
			ornament	2	38	67	<1	106	1	G			
			M—Door	110	7	100	<1	110	5	P			
			handle	11	3	53	<1	60	7	P			
			N—Door	11	6	77	<1	87	5	G			
			handle	9	3	59	<1	65	7	G			
			O—Door	15	7	98	<1	110	4	P			
			handle	19	4	48	<1	58	7	G			
			P—Door	8	8	200	<1	211	5	P	0.020	0.008	.....
			handle	21	2	49	<1	57	7	G			
11	1941	Chicago	A—Hood louvre	3	18	56	<1	76	3	G			
			B—Hood louvre	4	33	88	<1	123	2	G			
			C—Lamp	3	39	66	<1	107	3	G			
			bezel	3	35	97	<1	134	1	G			
			D—Lamp bezel	2	31	52	<1	84	6	G			
			E—Lamp	1	25	41	<1	67	7	G			
			bracket	3	35	85	1	122	2	G			
			F—Lamp	3	38	96	2	137	1	G			
			bracket	3	28	36	<1	66	6	G			
			G—Fender ornament	2	34	76	1	111	3	G			
			H—Fender ornament	3	43	94	<1	139	2	G			
			I—Fender ornament	1	27	63	1	91	3	G			
			J—Fender ornament	3	30	74	<1	106	4	G			
			K—Fender	2	25	64	<1	90	3	G			
			ornament	3	32	94	1	128	1	G			
			L—Fender	2	26	41	1	68	4	G			
			ornament	1	33	64	<1	98	2	G			
			M—Door	7	23	99	<1	125	3	P			
			handle	10	12	63	<1	78	6	P			
			N—Door	12	24	104	<1	132	3	P			
			handle	12	11	51	<1	66	6	G			
			O—Door	11	27	92	<1	123	4	P			
			handle	10	14	67	<1	84	6	P			
			P—Door	8	21	112	<1	136	3	G			
			handle	10	13	80	<1	96	4	G			
12	1941	Chicago	A—Door	12	26	125	1	155	3	P	0.017	.....	.....
			handle	9	16	59	<1	78	5	P			
			B—Door	12	30	125	<1	159	2	P			
			handle	†	15	55	<1	71	6	G			
			C—Windshield wiper	<1	31	57	<1	89	4	G	*	*	*
				<1	47	129	2	178	1	G			
			D—Windshield wiper	<1	30	28	<1	59	5	G			
				1	46	92	<1	139	1	G			

(*Continued next page*)

Car	Model	City	Part	Thickness of Coating in 0.00001 inch							Alloy Analysis		
				Diffusion Layer	Cu	Ni	Cr	Total (a)	Rating	Adhesion (b)	Mg	Pb	Cd
			E—Hood ornament	4	14	93	<1	109	3	P			
				3	19	214	<1	235	1	G			
13	1941	Chicago	A—Door handle	12	20	106	<1	130	4	P			
				11	13	65	<1	82	6	P			
			B—Door handle	16	14	72	1	91	5	P			
				14	10	40	<1	55	7	P			
14	1942	Detroit	A—Hood ornament	8	31	91	<1	125	1	G			
				6	2	15	<1	19	7	G			
				8	5	55	<1	63	4	G			
			B—Trunk ornament	3	21	135	<1	158	1	G			
				†	14	53	<1	68	5	G			
				1	25	68	<1	94	3	G			
			C—Direction light	<1	59	146	<1	206	4	G	0.017	0.030	0.013
				<1	72	252	<1	325	1	G			
				<1	57	127	<1	185	2	G			
				1	50	93	<1	144	6	G			
			D—Door handle	10	202	38	<1	243	3	G			
				11	65	23	<1	92	5	G			
			E—Door handle	11	44	74	<1	122	1	G	Low Al		
				7	27	36	<1	66	1	G			
15	1942	Detroit	A—Hood latch	1	16	102	<1	119	2	G	Low	Al (0.009)	
				1	16	82	<1	99	6	G			
				1	17	92	<1	110	3	G			
16	1942	Detroit	A—Windshield wiper	2	36	45	<1	82	7	P			
				†	41	152	3	196	1	P			
17	1941	Palmerton	A–Hood ornament	0	0	21	<1	22	3	G			
				0	0	39	1	40	1	G			
18	1940	Chicago	A—Hood ornament	1	32	167	1	198	1	G			
				1	22	68	<1	91	6	P			
			B—Door handle	1	20	64	<1	85	5	G			
				1	17	22	<1	40	5	G			
			C—Door handle	1	27	67	2	96	2	G			
				1	20	31	1	52	5	G			
19	1940	Chicago	A—Hood release	<1	12	45	<1	58	5	G			
20	1941	Chicago	A—Door handle	3	31	48	<1	81	1	G			
				3	26	37	<1	65	4	G			
			B—Door handle	4	29	51	<1	62	1	G			
				<1	24	33	<1	58	4	G			

(a) Cu + Ni + Cr + 25% (estimated Cu equivalent) of diffusion layer.
(b) G = good adhesion; P = poor adhesion.
*Within A.S.T.M. limits. †Doubtful if any was present.

thinnest areas. Approximately 75 per cent fell below 0.0010 inch in thickness, while only one part in seventy-one met a minimum specification of 0.0015 inch.

Adhesion

It will be observed that the open circles (poor adhesion) tend to fall to the right of the solid circles (good adhesion). Extreme cases are the two points far to the right in the Chicago portion of Fig. 2 representing coatings with very poor adhesion. The relative positions of the open and solid circles show, of course, that poorly adherent coatings give poorer service in equal thicknesses or require greater thickness for equal service. In spite of the admitted deficiencies of the knife test, the trends are so clear cut that the conclusion must be drawn that best service performance requires good coating adhesion.

It is evident from the fact that the points fall on a band rather than a single line that factors other than

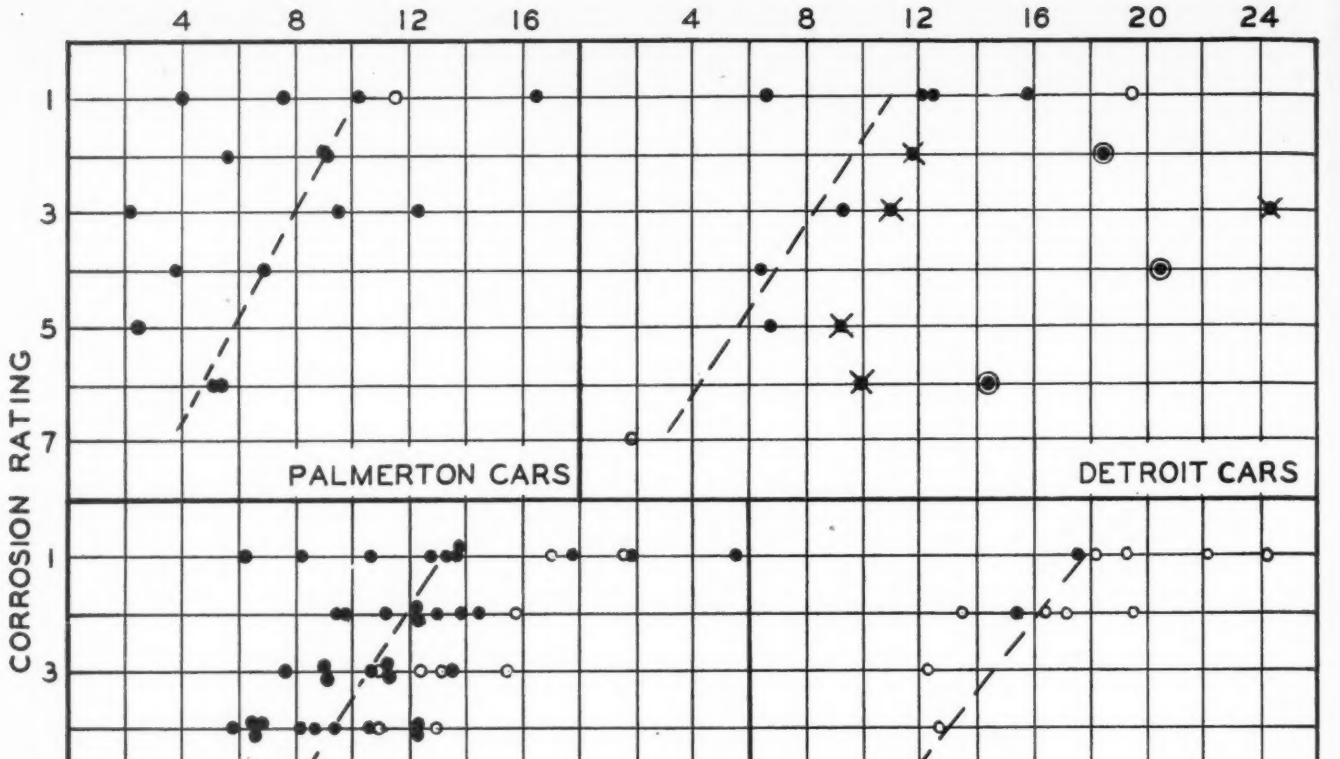


Fig. 2. Corrosion ratings vs. coating thickness on zinc base alloy die castings after about 5 years exposure (see Table I)

thickness have also been operative. The role of adhesion has just been considered. It is certain that the band width would have been greatly decreased had all of the coatings been equally adherent. Important contributors to band width are the probable errors in the measurement of the coating thickness and the assignment of the corrosion rating. There is also a definite difference between cars attributable to differences in owner care, which probably accounts for the part of the band width not explained by the above observations.

Casting Composition

In the figure, there are points sufficiently removed from the main mass of points to constitute exceptions; two of these, those far to the right in the Chicago portion of Fig. 2, have already been ascribed to very poor adhesion. In this same portion, there are three

TABLE II. ANALYSES OF CASTINGS WITH BADLY FAILED COATINGS

Car	Part	Portion of Fig. 2	Analysis—%			
			Mg	Pb	Cd	Sn
14	C	Detroit	0.017	0.030	0.013	No Test
10	C	Chicago	0.017	0.020	0.007	0.0015
10	D	Chicago	0.018	0.020	0.0075	0.001
10	K	Chicago	0.045	0.0075	0.0013	0.001
A.S.T.M.	Minimum		0.03	.....	.....	.....
A.S.T.M.	Maximum		0.08	0.007	0.005	0.005

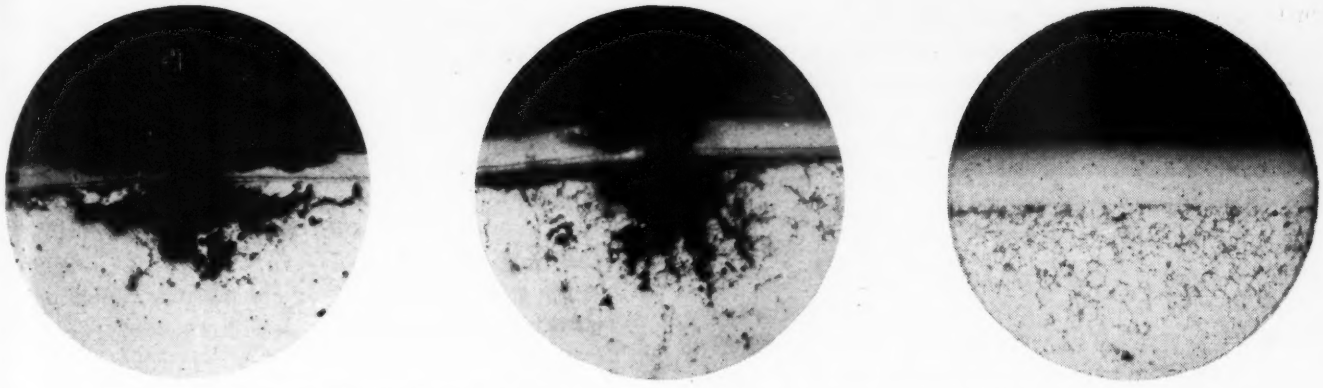


Fig. 3. Left: corroded plated coating from part A, car 1, with normal service life; non-intergranular corrosion of on-grade alloy. Center: corroded plated coating from part B, car 10, with inferior service life for coating thickness; severe intergranular corrosion of alloy. Right: plated coating near point of penetration from part C, car 14, with inferior service life for coating thickness; intergranular corrosion of alloy spreading under plate. Unetched. 250X

points (within a single circle) with a corrosion rating of 7, which represent sufficiently heavy coatings to raise the question as to why they failed so badly. Three circled solid points in the Detroit portion represent the coatings in different areas on a single casting that failed more badly than the coating thicknesses would imply. In all of these instances, the adhesion of the plate was indicated to be satisfactory.

The analyses of the castings are given in Table II. All of these parts exceed the A. S. T. M. maximum for lead; three of them fall below the minimum for magnesium and above the maximum for cadmium. Intergranular corrosion, which is anticipated in off-grade alloys on exposure to the atmosphere, should be particularly bad in the case of the first three parts listed. Part 10K would be expected to show some intergranular corrosion but in much lower degree than the other and more heavily contaminated parts.

It may seem difficult at first thought to explain how intergranular corrosion, which depends on contact with the atmosphere, could occur where the casting is mechanically shielded from such contact by a heavy metallic coating. The photomicrographs in Fig. 3 clearly reveal the mechanism. It is apparent, as will be discussed more fully later, that the failure of a plated coating takes place by the finding of the production of an actual opening through which moisture can attack the underlying metal. Where the zinc alloy is on-grade in composition, the normal type of corrosion occurs, stimulated galvanically by contact with copper and nickel. When the pressure due to the bulk of the resulting zinc corrosion products becomes sufficiently great, the plate is pushed up to form a blister.

When the die casting is made of alloy not meeting the A. S. T. M. specifications, contact with atmospheric moisture at these points of penetration results in widespread intergranular corrosion in addition to the normal attack. Since intergranular corrosion results in a large expansion of the casting surface, the forces tending to lift the plate are greatly augmented, and more conspicuous failures by blistering occur at an earlier time than with on-grade castings. While not all of the castings were analyzed, those on which the plating behaved normally were found to be on-grade in every case where an analysis was made. It

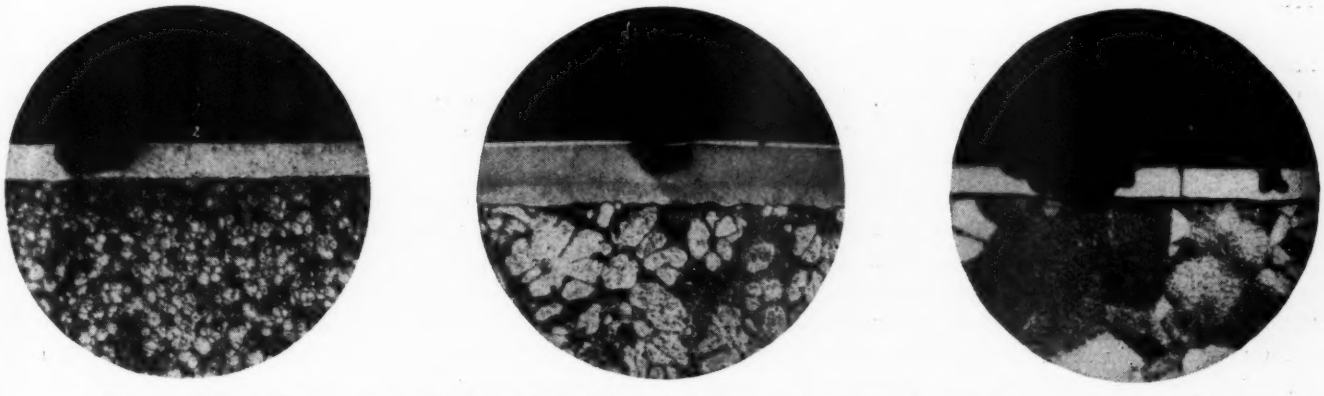


Fig. 4. Typical corrosion pits in nickel plate. Left: on part B, car 2; center on part A, car 10; both zinc base alloy die castings. Right: on part C, car 18, a brass escutcheon; note small hole and crack to right of main hole. 500X

must be concluded that improper alloy composition must be added to insufficient coating thickness and poor coating adhesion as causes of premature plate failure.

In Fig. 2, several points in the Detroit portion are plotted as solid dots crossed with an X. These were obtained from parts cast from the low aluminum content alloys which die casters were compelled to use during the war. It is evident that the plated coatings on these parts were inferior in performance to those on castings of normal composition. As a matter of interest, the parts secured from the Detroit area reveal every presently discussed cause for poor plate performance: insufficient thickness, poor adhesion, alloy contamination, and low aluminum content. These parts were taken from 1942-model cars and are probably more revealing of the difficulties encounteres in making parts at that time than of deficiencies in practice in normal times. The results, however, cast a warning which must not be disregarded if good plate performance is to be obtained.

Mechanism of Failure

The one hundred and thirty-two microscpecimens of plated coatings from a variety of sources and from at least four service environments afforded an excellent opportunity to obtain some information on the mechanism of plate failure. It was observed that the coatings on parts from all locations contained holes of various depths, as shown in Fig. 4, left and center. In blistered areas, the holes had penetrated to the zinc which then corroded and lifted the plate as a blister. An excellent illustration of this is seen in Fig. 3, left and center. That the failure by this means is not a function of the basis metal is shown by Fig. 4, right, which shows a section through a brass escutcheon from one of the door handles included in this study. The only differences between the events illustrated by Fig. 3, left, and Fig, 4, right, lie in the rates and types of corrosion of the basis metals after the coatings have been penetrated.

The mechanism by which the plate is penetrated needs study. The degree to which the nickel itself has been corroded in Fig. 3, left and center, strongly indicates that some of the openings may be produced by a pitting type corrosion of the nickel. Whether the location of such pits is entirely fortuitous or is caused by discontinuities, basic salt inclusions, or other influences in the plate remains to be discovered. It is obviously important that the mechanism of plate failure be determined. Should it be found that failure occurs by simple corrosion pitting independent of any factor involved in the plating operation, the only methods for obtaining improved life would be to increase the coating thickness or to improve the corrosion resistance of the deposit. If, on the other hand, factors involved in the plating are at least partly contributory to the failure, changes in technology could be expected to yield an improvement.

Required Coating Thickness

It is of some interest to examine the present data to determine, if possible, what coating thickness would have been required to have given perfect service over the five years between 1941 and 1946. Examination of the unquestioned solid points in Fig. 2 indicates that the minimum thickness of coatings which have given this perfect service are as follows:

Location	Minimum Total Thickness inch
Palmerton	0.0012
New York	0.0012
Detroit*	0.0013
Chicago	0.0015

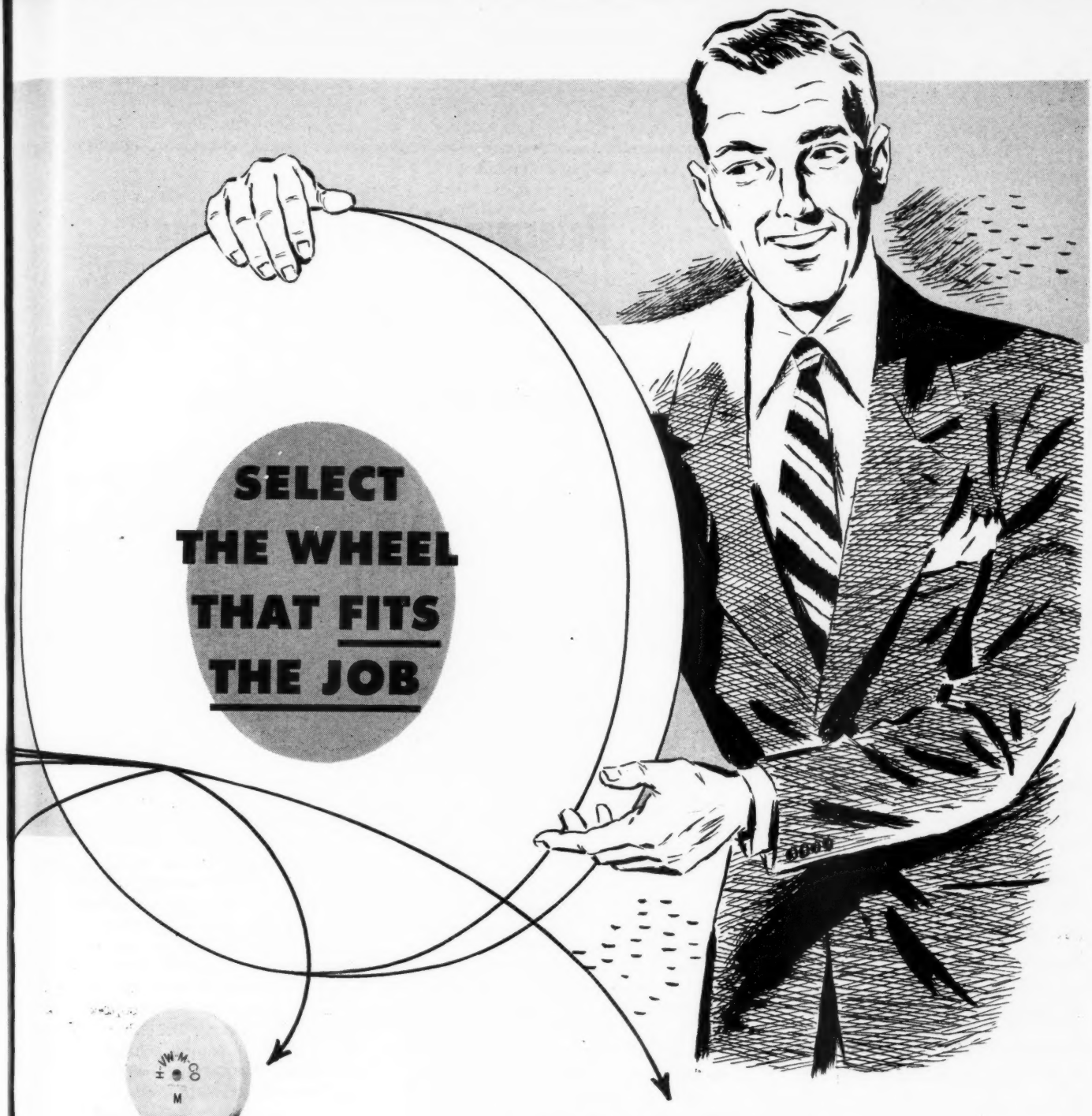
*1942 cars—four years' service

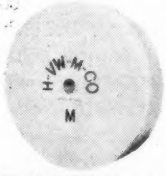
The fact that the Detroit cars were 1942 models with only four years of service makes a direct comparison with the Chicago area impossible. It would seem, however, that the Chicago environment is at least on a par with Detroit in severity. It is not known whether there are any locations with automotive service which are more severe than the Chicago area. The comparative mildness of the New York conditions is surprising. However, the cars sampled in this location are kept in suburban towns and are seldom in New York City.

The present evidence indicates that perfect performance for five years cannot be expected in corrosive locations unless the coating thickness is brought up to a minimum of 0.0015 inch. It must be emphasized that this minimum thickness will give the desired result only if the coatings are adherent and the castings are on-grade in composition and substantially free from surface defects. Much could be said about the technical and economic problems involved in making so large a change from present thickness levels, but such a discussion would be foreign to the purpose of this paper.

It is hoped that this analysis of the performance of a relatively small number of parts from a few locations will be of sufficient interest to others to stimulate further examinations of this type. The advantage of this approach over the laboratory exposure type of examination is obvious. The parts taken from an actual car include every variable involved in production and in service. The present data represent the conditions found after five years of operation. Useful information might be obtained if models for a given year were sampled after different periods of use. The rate of failure data thus obtained would furnish an excellent criterion for the calibration of laboratory acceptance tests.

SELECT THE WHEEL THAT FITS THE JOB





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Determination of Impurities in Electroplating Solutions

VII. TRACES OF SILICA IN NICKEL PLATING BATHS

The purpose of this investigation was to develop quantitative methods for the determination of silica in nickel plating baths.

A literature survey for analytical methods that have been used for determining silica in nickel baths proved fruitless. Neither gravimetric nor colorimetric methods have been reported, although without doubt many industrial laboratories have their own unpublished methods.

There are, however, hundreds of reports in the literature on the determination of silica in materials such as steels, aluminum alloys, rock, water, biological matter, foods, and chemicals. Most of the silica methods can be divided into two groups—gravimetric and colorimetric procedures. The most widely used gravimetric methods are those in which the silica is dehydrated either with hydrochloric acid with subsequent evaporation and baking or with perchloric acid. Of the two, the perchloric acid method[25,4,15,16,6,5,17] is the more rapid and simpler to carry out. One need only heat the solution till fumes of perchloric acid are evolved copiously and then continue heating the solution for 5 to 10 minutes more to dehydrate all the silica. In the hydrochloric acid method[13,14,26], the solution is taken down to dryness, baked for a while, and the salts redissolved in hydrochloric acid. Very often this process is repeated before the samples are finally diluted and filtered. Following dehydration of the silica, both methods are the same. In neither method is all the silica completely removed by one dehydration. To recover all the silica, the filtrate from the first dehydration must be reprocessed.

Colorimetric methods for the determination of silica, although not as accurate as the gravimetric methods, are very rapid and sufficiently accurate for control purposes. The methods having the widest application are those in which the dissolved silica reacts with ammonium molybdate at a definite *p*H to form the yellow heteropoly acid $H_8Si_2(Mo_2O_7)_6$. The color is sufficiently sensitive to be used for the colorimetric determination of silica, but a more sensitive method results from the reaction of the yellow complex with a suitable reducing agent to form the molybdenum-blue complex. Jolles and Neurath[7] were the first investigators to use the yellow colored complex for the determination of silica; since then it has been applied to the analysis of silica in water[3,19,21,9,22], copper base alloys[2], boiler water[20], and others. Kahler[8], only one of many investigators who have utilized this reaction, used the molybdenum-blue reaction to determine silica.

In this investigation, it seemed to be desirable to develop both a precise gravimetric and an approximate colorimetric procedure for the determination of silica in nickel baths. The methods discussed briefly above were investigated to see if they could be applied to the problem.

Gravimetric Determination

Developmental Work

In applying the perchloric acid method to nickel plating baths, the only obvious difficulty which presented itself was the dehydration of the silica in the presence of large amounts of crystallized nickel salts.

To test this point, a synthetic 50–50 nickel bath was prepared containing 97.2

g $NiCl_2.6H_2O$, 181 g $NiSO_4.6H_2O$, and 30 g boric acid per liter. In addition, a number of ions usually found as impurities in an operating nickel plating bath were added to this synthetic bath. The ions and the amounts added are shown in Table I.

TABLE I. IONS ADDED TO NICKEL BATH

Ion	Amount g/l	Ion Added as
Aluminum	1.0	$Al_2(SO_4)_3.18H_2O$
Cadmium	0.2	$CdCl_2.2\frac{1}{2}H_2O$
Chromium	0.2	CrO_3
Copper	1.0	$CuCl_2.2H_2O$
Lead	0.05	$Pb(C_2H_3O_2)_2.3H_2O$
Manganese	1.0	$MnCl_2.4H_2O$
Zinc	1.0	$ZnSO_4.7H_2O$
Iron	1.0	$FeCl_3.6H_2O$
Calcium	(Saturated)	$CaBr_2$

Fifty milliliters of this synthetic bath were then transferred to a 400-ml casserole and varying quantities of a standard sodium silicate solution added. This solution was prepared according to the method of Woodman and Cayvan[27] and stored in a waxed bottle.

The solution was boiled to half volume, 30 ml nitric acid added, and the solution again boiled to half volume to destroy organic matter. Then 35 ml perchloric acid were added and the solution boiled to white fumes, if possible. In most cases, nickel salts separated out before the silica was dehydrated and further dehydration was impossible. Then various amounts of perchloric acid were added to see whether, by increasing the amount of acid, the solution could be brought to fumes and fumed for 5 to 10 minutes before salts separated out. It was found that this could be accomplished if one used about 75 ml acid. However, the fuming time had to be controlled; if the solution was allowed to fume for a longer period than about 10 minutes, varying quantities of a brown precipitate formed which did not dissolve on subsequent treatment and made the results obtained erratic; the precipitate was found to consist largely of ferric oxide and manganese dioxide. By controlling the fuming time and the amount of perchloric acid, these difficulties could be overcome and the perchloric acid method could be used for determining silica in nickel baths.

Recommended Routine Procedure for Gravimetric Determination. The gravimetric procedure finally used for the determination of silica in nickel plating baths is as follows:

Solutions Required

1. Perchloric acid ($HClO_4$)—70 per cent, C. P. grade
2. Nitric acid (HNO_3)—sp.gr. 1.42, C. P. grade
3. Sulfuric acid (H_2SO_4)—sp.gr. 1.84, C. P. grade
4. Hydrofluoric acid (H_2F_2)—48 per cent, C. P. grade
5. Perchloric acid wash solution—2 per cent
   Dilute 20 ml $HClO_4$ (70%) to 1 liter with distilled water.

Apparatus Required

1. Casseroles, 400 ml
2. Platinum crucibles with lids
3. Long stem funnels
4. Watch glasses
5. Nickel forceps and triangles
6. Desiccator and balance
7. Sand bath or Bunsen burners
8. Meker burners or a muffle furnace

Procedure

Dehydration. 1. Pipette 50 ml of the nickel bath into a 400-ml casserole.
2. Add 20 ml concentrated nitric acid, and boil until nickel salts just begin to separate out. Allow the solution to cool about five minutes, and dilute the solution to its original volume with distilled water.
3. Add 75 ml perchloric acid.
4. Place the casserole on a sand bath or over a Bunsen flame till copious fumes of perchloric acid are evolved, keeping the casserole covered with a watch glass. Allow the solution to fume strongly for 5 to 10 minutes.
5. Allow the solution to cool in a water bath. Then add 20 ml distilled water, washing any adhering silica from the watch glass into the casserole.

Filtration. 6. Filter the solution immediately using an 11 cm No. 40 Whatman paper. Transfer all the silica from the casserole to the filter paper using a rubber policeman and hot 2 per cent perchloric acid.
7. Wash the silica 8 times with hot 2 per cent perchloric adid.
8. Wash most of the perchloric acid out of the paper with 3 to 4 washings of distilled water.

Ignition. 9. Place the folded filter paper containing the silica into a weighed platinum crucible and burn off the paper over Bunsen flame.
10. When the paper has completely burned off, heat strongly over a Meker burner for 15 minutes, cool in the desiccator and weigh.
11. Volatilize the silica using 10 drops of sulfuric acid and 5 ml of hydrofluoric acid. Reweigh after heating strongly and again cooling in the desiccator. The weight of silica as SiO_2 is thus obtained by differences.

Sample Calculations

To calculate the amount of silica per liter of plating bath analyzed, one need only multiply the weight of silica obtained from the 50 ml sample taken by $\frac{1000}{50}$, or 20, to obtain the value in grams per liter. For example:

Wt. of crucible + silica + other salts = 20.1646 grams
Wt. of crucible after fuming with H_2F_2 = 20.1241 grams

True wt. of silica in the 50 ml sample = 0.0405 grams

Thus the amount of silica in a liter of the bath is 0.0405 x 20 = 0.8100 gram. To convert this figure to parts per million, multiply by 1000, obtaining in this case 810 ppm.

Colorimetric Determination

Developmental Work

Since the yellow silico-molybdate method was rapid and seemed sensitive enough for the concentration range to be covered, its applicability to the nickel bath was investigated.

There are three factors that bear consideration in the successful application of this method: the *p*H of the solution[18,12], the time required for maximum color development[2,18], and the elimination of interfering ions such as the phosphate ion[10,11,23].

To check the hydrogen ion concentration at which maximum color development can be obtained, 5 ml of the pure synthetic 50–50 nickel bath described earlier, 100 micrograms of silica, ammonium molybdate, and varying amounts of 2-N sulfuric acid were appropriately mixed together and diluted to 100 ml with distilled water, and the *p*H of the solution measured with a Beckman *p*H meter. After 15 minutes the transmittancy of the solution was measured with a Klett-Sommerson colorimeter. The readings obtained showed that maximum color development occurred within the *p*H range of 1.5 to 2.0 which compares favorably with the results of Knudson, Juday and Meloche[12]. While these tests were being run, it was noted that the ammonium molybdate solution did not remain stable for any appreciable length of time; hence the sulfuric acid-ammonium molybdate reagent recommended by Bunting[1] was used in subsequent tests and found to be satisfactory. Two ml of this reagent was found to be enough for proper *p*H adjustment and full color development.

The time required for full color development was found to be about 15 minutes, and the color remained constant for at least 30 minutes.

Since the presence of the nickel imparted a dark green color to the solution and resulted in a high blank read-

ing, an attempt was made to remove the nickel by electrolysis. An aliquot of the bath was made alkaline with ammonium hydroxide, 2 g ammonium sulfate added, and the nickel plated out using platinum electrodes. While the method worked quite well for the pure bath, it did not work when the "impurities" were present. Even after an hour considerable nickel was still in solution. In addition, a precipitate formed which did not completely redissolve when the solution was acidified. Because of these difficulties, the electrolytic separation of nickel was abandoned.

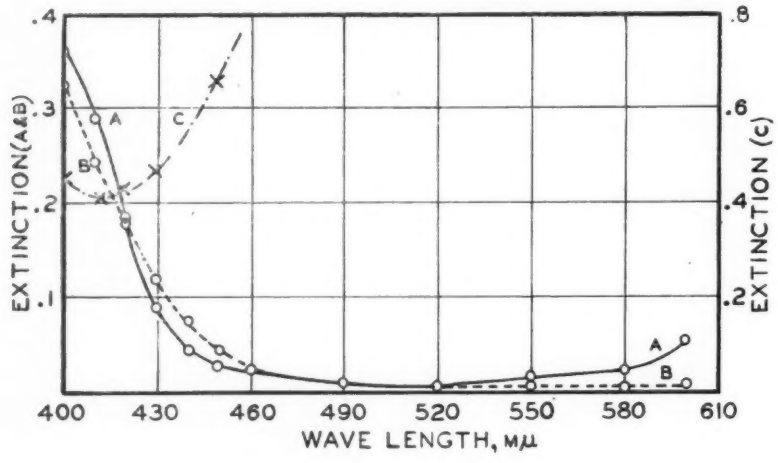

Fig. 1. Extinction vs. wave length for (A) 50-50 nickel bath, (B) 2.5 mg silica as the yellow silico-molybdate complex in 100 ml, (C) Klett-Sommerson blue filter No. 42 (extinction units on the right)

As the nickel could not be readily eliminated from the solution, it was thought that since the nickel color was dark green and the silico-molybdate complex was greenish yellow, a wave length band could be found at which the nickel would absorb little light while the silico-molybdate complex would absorb strongly. Using a Beckman U. V. Spectrophotometer, the extinction of the pure nickel bath was measured at various wave lengths, and from the data, its transmittancy curve (A) shown in Fig. 1 was plotted. The same was done for the pure silico-molybdate complex, (B) in Fig. 1. A comparison of the two transmittancy curves showed that there was no wave length in the visible portion of the spectrum at which the silico-molybdate complex would absorb strongly while the nickel solution absorbed little light.

Since no simple method for eliminating the interference of the nickel color was apparent and since it could be compensated for by running a suitable blank, no further effort was made to remove it. Subsequent results showed that although the blank readings were high, they did not seem to affect the accuracy or precision of the method as finally developed.

The above tests finally led to a procedure which included the following steps:

1. Addition of the ammonium molybdate-sulfuric acid reagent to a 5 ml portion of the bath to adjust the *p*H of the solution and form the silico-molybdate complex.

2. Dilution of the solution to 100 ml and allowing it to stand for 15 minutes in order that the color be developed to its maximum intensity.

3. Measurement of the transmittancy of the solution using as a blank a similar run except for the addition of the ammonium molybdate.

Preparation of the Calibration Curve. Data for the preparation of the calibration curve are obtained by running a series of successive tests in which 0.1 to 1.0 milligram of silica as sodium silicate is added to 5 ml of the pure synthetic 50–50 nickel bath in a 100 ml flask. The flask is filled ¾-full with distilled water, 2.0 ml acid-molybdate solution is added, and the solution is mixed well. The flask is diluted to the mark with distilled water and shaken well again. After 15 minutes, the transmittancy of the solution is measured as described under "Recommended Routine Procedure" and corrected for the blank. The readings obtained are shown in Table II.

When micrograms of silica added are plotted as ordinates against the corrected colorimeter readings as abscissa, the curve shown in Fig. 2 is obtained. The curve is linear and hence the colored system follows Bouguer-Beers Law over the range of from 0 to 800 micrograms of silica. For concentrations higher than 800 micrograms, the curve is not linear and Bouguer-Beers Law is not obeyed. As long as the calibration curve is used in determining the amount of silica in an unknown, this deviation causes no inaccuracy.

The data for the calibration curve were obtained with a Klett-Sommerson colorimeter using the blue filter (No. 42) sold with the instrument. If one uses an instrument having a wave length dial, it should be set at 400 mμ. (C) in Fig. 1 is the transmittancy curve of the filter used in this investigation. It shows maximum transmittancy at a wave length of about 415 mμ. The data for all the transmittancy curves shown in Fig. 1 were obtained with a Beckman U. V. Spectrophotometer using 1 cm Corex cells.

Recommended Routine Procedure for Colorimetric Determination. The colorimetric procedure finally used for the determination of silica in nickel plating baths is as follows:

Solutions Required:

1. Sulfuric acid-ammonium molybdate reagent, 7.5 per cent. Dissolve 75.0 g C. P. ammonium molybdate in 800 ml distilled water and add 60 ml concentrated sulfuric acid. Dilute to 1 liter.

TABLE II. CALIBRATION CURVE DATA

Silica Added microgram	Colorimeter Readings (3 determinations)			Average Readings	Blank	Corrected Average Readings
Blank	69	70	70	70	70	0
100	77	76	78	77	70	7
200	86	87	88	87	70	17
300	93	94	95	94	70	24
400	104	103	103	103	70	33
500	114	114	112	114	70	44
600	118	119	120	119	70	49
700	129	127	128	128	70	58
800	135	133	135	134	70	64
900	142	141	140	141	70	71
1000	147	145	146	146	70	76

Each determination = average of 5 readings of the colorimeter scale.

2. Standard silica solution, 100 micrograms/ml. Dilute 10 ml commercial water glass to 1 l with distilled water. Filter and analyze the solution gravimetrically for silica and dilute it so that each milliliter contains 0.1 mg silica. Pipette 5 ml of this stock solution into a 250-ml pyrex beaker, add about 125 ml water and 1.0 g sodium bicarbonate, and heat the solution to boiling. The bicarbonate will dissolve any colloidal silica present and tend to prevent its formation on standing. Cool, transfer the solution to a 250-ml volumetric flask, and dilute to the mark. Transfer the solution to a waxed or rubber bottle. In making up this solution, use water free of silica.
3. Sulfuric acid, 2-N solution.

Apparatus Required

1. Colorimeter or spectrophotometer—Klett-Sommerson colorimeter with a blue No. 42 filter and a 2-cm cell was used. Any colorimeter with a suitable filter or any spectrophotometer may be used.
2. Volumetric flasks, 100 ml and 250 ml
3. Pipettes
4. Burettes

Procedure

1. Pipette a 5.0-ml aliquot of the nickel plating bath to be analyzed into a 100-ml volumetric flask.
2. Add approximately 75.0 ml distilled water.
3. From a burette, run in 2.0 ml acid-molybdate reagent.
4. Without any delay shake the solution for about 15 seconds, dilute to the mark with distilled water, and shake again to obtain uniform mixing. Allow the solution to stand for 15 minutes to develop the color.
5. Using a 2-cm cell, with distilled water as the reference liquid, adjust the colorimeter galvanometer to the zero position with the scale reading at zero. If a spectrophotometer is used, set the wave length scale to 400 mμ before adjusting to zero.
6. Replace the distilled water in the cell with the solution to be tested.
7. Rotate the colorimeter dial until the galvanometer pointer again returns to the zero position. Record the scale reading obtained.
8. Move the colorimeter dial to throw the galvanometer pointer off the zero point, and repeat step 7 four times, obtaining a total of five readings. The average of the five numbers is used as the colorimeter reading for the sample.
9. Run a blank using exactly the same procedure as above, except for step 3, in which the acid-molybdate reagent is replaced by 2.0 ml 2-N sulfuric acid.
10. The blank is subtracted from the test solution reading to obtain the corrected reading for the unknown solution. This corrected reading is then referred to the calibration curve, and the corresponding amount of dissolved silica may be read off the curve. This method of correcting for the blank can be used only when the scale readings of the colorimeter give the extinction of the sample directly or when they are proportional to the extinction.

Sample Calculations

Suppose that the colorimeter reading for a 5.0-ml aliquot of the nickel plating bath is 158 and the blank gives a reading of 93; the corrected reading would then be 158 − 93 = 65. Referring to the calibration curve, the scale reading 65 corresponds to 800 micrograms of silica. Therefore, 5.0 ml of the nickel bath tested contains 800 micrograms or 0.8 mg dissolved silica. To obtain the silica concentration in the nickel bath in parts per million, multiply by 200 (the concentration in milligrams per liter is equivalent to parts per million). Hence, the solution contains 0.8 x 200 = 160 ppm silica.

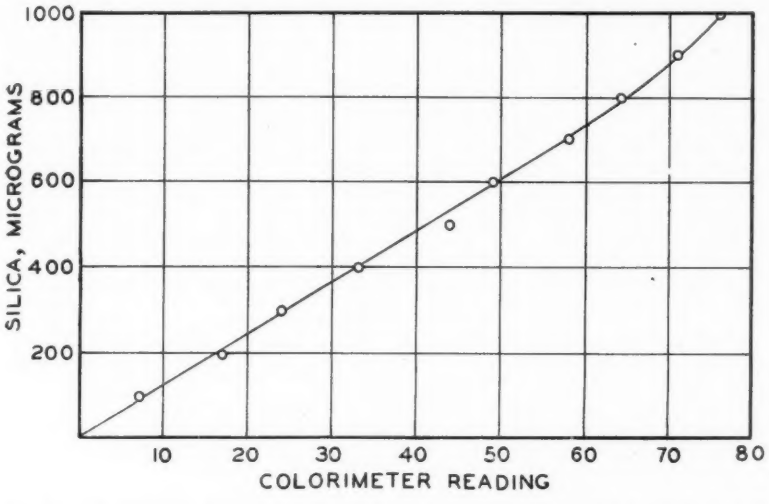

Fig. 2. Calibration curve for determination of silica in nickel plating baths (50-50 bath used) as the silico-molybdate complex. Instrument used: Klett-Sommerson colorimeter with blue filter No. 42. Final volume of solution: 100 ml

For amounts of silica of 140 ppm or less, where the calibration curve is a straight line, the amount of silica present may be calculated without resort to the calibration curve. The unknown solution, a nickel solution containing a known amount of silica, and blanks on each are run. After each reading has been corrected for blank, the following formula yields direct results:

$$\frac{\text{ppm in known solution}}{\text{corrected reading of known}} \times \text{corrected reading of unknown} = \text{ppm silica of unknown}$$

"Stop and Go" Method

This method may be used to estimate silica in nickel plating baths without the use of a colorimeter.

Procedure

1. The procedure described under "Recommended Routine Procedure for Colorimetric Determination" is followed through step 4, except that a 100-ml Nessler tube is used in place of the 100-ml volumetric flask.
2. Compare the unknown with a set of standards which are made up in the same manner using a synthetic nickel plating bath of approximately the same composition as that to be analyzed. Quantities of silica are added as described under "Preparation of Calibration Curve." Six Nessler tubes, containing 200, 400, 600, 800, 1000 micrograms of silica and a blank, should be used in preparing the standards. The unknown tube is compared with the set of standards by visual observation, viewing the tubes horizontally against a white background. The amount of silica present may be thus estimated within 40 ppm. The standards must be made up at the time of analysis since they do not remain constant for long periods of time.

Accuracy Obtainable by Gravimetric and Colorimetric Methods

As shown in Table III, the gravimetric method yields results with an average error of 3.1 per cent for all values shown. If the obviously bad run showing an

error of 18.4 per cent is dropped, the average error becomes 1.9 per cent. When sufficiently large samples are taken the per cent error becomes correspondingly less.

TABLE III. ACCURACY OF GRAVIMETRIC METHOD

Silica Added grams	Silica Found grams	Differenec grams	Error %
0.0049	0.0049	0.0000	0.0
0.0049	0.0040	−0.0009	18.4
0.0049	0.0047	−0.0002	4.1
0.0098	0.0093	−0.0005	5.1
0.0098	0.0097	−0.0001	1.0
0.0245	0.0241	−0.0004	1.6
0.0245	0.0234	−0.0011	4.5
0.0343	0.0341	−0.0002	0.6
0.0343	0.0340	−0.0003	0.9
0.0343	0.0336	−0.0007	2.0
0.0490	0.0479	−0.0011	2.2
0.0490	0.0489	−0.0001	0.2
0.0490	0.0491	+0.0001	0.2

The colorimetric results shown in Table IV show that in general the errors do not exceed 10 per cent, although with very small amounts of SiO_2 the error may be higher. The nickel bath used for the accuracy and reproducibility tests was [illegible] as previously described. Before use in tests, all plating baths were filtered through a No. 40 Whatman filter paper to remove undissolved matter.

Table V indicates the precision attainable by this analytical procedure. The average error of the seven runs is about 2.4 per cent.

Applicability of Methods

Both the colorimetric and gravimetric methods should be applicable to any nickel plating bath; they have been used to determine silica in the 50–50 bath and the all-chloride bath with satisfactory results.

Discussion

In the gravimetric method precautions should be taken so that the solution is not fumed too long. If the volume is brought down too far, a heavy brown precipitate forms which does not redissolve, thus making the silica "dirty" and difficult to filter. When the silica is clean and easily filtered, the time of operation is cut considerably and better results are obtained.

The greatest difficulty in running the colorimetric method was in obtaining a standard silica solution which remained constant. The method does not determine precipitated or colloidal silica, hence it was found necessary to boil the standard with sodium bicarbonate before using, otherwise erratic results were obtained. If the standard thus boiled is too much on the alkaline side, it may be made just acid with nitric acid before final dilution. When an unknown is run according to the procedure described, the *p*H may be checked after the final dilution to 100 ml to determine whether the acidity is within the range required for maximum color development.

TABLE IV. ACCURACY OF COLORIMETRIC METHOD

Silica Added microgram	Colorimeter Reading	Blank	Corrected Reading	Silica Found microgram	Difference microgram	Error %
100	108	100	8	97	− 3	3.0
200	119	100	19	230	+30	15.0
300	127	100	27	325	+25	8.3
400	127	93	34	410	+10	2.5
500	144	100	44	530	+30	6.0
600	156	100	56	675	+75	12.5
700	163	100	63	770	+70	10.0
800	153	85	68	845	+45	5.9
900	172	100	72	920	+20	2.2
1000	178	100	78	1050	+50	4.0
1000	169	93	76	1000	0	0.0

TABLE V. PRECISION OF COLORIMETRIC METHOD

Silica Added microgram	Colorimeter Reading	Blank	Corrected Reading	Silica Found microgram	Difference microgram	Error %
600	142	93	49	590	−10	1.7
600	145	93	52	630	+30	5.0
600	141	93	48	580	−20	3.3
600	142	93	49	590	−10	1.7
600	143	93	50	605	+ 5	0.8
600	143	93	50	605	+ 5	0.8
600	144	93	51	615	+15	2.5

Summary

A gravimetric method for the determination of silica in nickel plating baths is described. The silica is dehydrated with perchloric acid, filtered, ignited and weighed. The weight of the silica is obtained by difference after volatilizing it with hydrofluoric acid.

Soluble silica is determined colorimetrically by measuring the amount of incident light absorbed by the yellow silicomolybdate complex formed by the reaction of ammonium molybdate and silicic acid. This is accomplished in the presence of nickel and other ions in nickel plating baths. A "Stop and Go" method with Nessler tubes that can be used for the estimation of soluble silica is described. In this investigation, a Klett-Sommerson colorimeter with a blue No. 42 filter was employed.

BIBLIOGRAPHY

[1]Bunting, W. E., Ind. Eng. Chem., Anal. Ed. **16**, 612 (1944).
[2]Case, O. P., Ind. Eng. Chem., Anal. Ed. **16**, 309–311 (1944).
[3]Dienert, F., and Wandenbulke, F., Bull. Soc. Chim. **33**, 1131–1190 (1923).
[4]Fish, F. H. and Taylor, F. M., Jour. Chem. Education **10**, 246 (1933).
[5]Fowler, R. M., Ind. Eng. Chem., Anal. Ed. **4**, 382–385 (1932).
[6]Hadley, W. H., Analyst **66**, 486–489 (1941).
[7]Jolles, A., and Neurath, F., Z. angew. Chem. **11**, 315 (1898).
[8]Kahler, L. H., Ind. Eng. Chem., Anal. Ed. **13**, 536–539 (1941).
[9]King, E. J. and Lucas, C. A., J. Am. Chem. Soc. **50**, 2395–2397 (1928).
[10]King, E. J., J. Biol. Chem. **80**, 25–31 (1928).
[11]King, E. J., Ind. Eng. Chem., Anal. Ed. **3**, 117–118 (1931).
[12]Knudson, H. W., Juday, C., and Meloche, V. W., Ind. Eng. Chem., Anal. Ed. **12**, 270–273 (1940).
[13]Kolthoff, I. M. and Sandell, E. B., "Textbook of Quantitative Inorganic Analysis", pp. 377–388, 404. The MacMillan Company, New York (1936).
[14]Lundell, G. E. F., Hoffman, J. I., and Bright, H. A., "Chemical Analysis of Iron and Steel", pp. 254–263. John Wiley & Sons, New York (1931).
[15]Pinsl, H., Z. Metallkunde **27**, 107 (1935).
[16]Pinsl, H., Arch. Eisenhüttenw. **9**, 223 (1935).
[17]Rees, O. W., Ind. Eng. Chem., Anal. Ed. **1**, 200–201 (1929).

(*Continued on page 196*)

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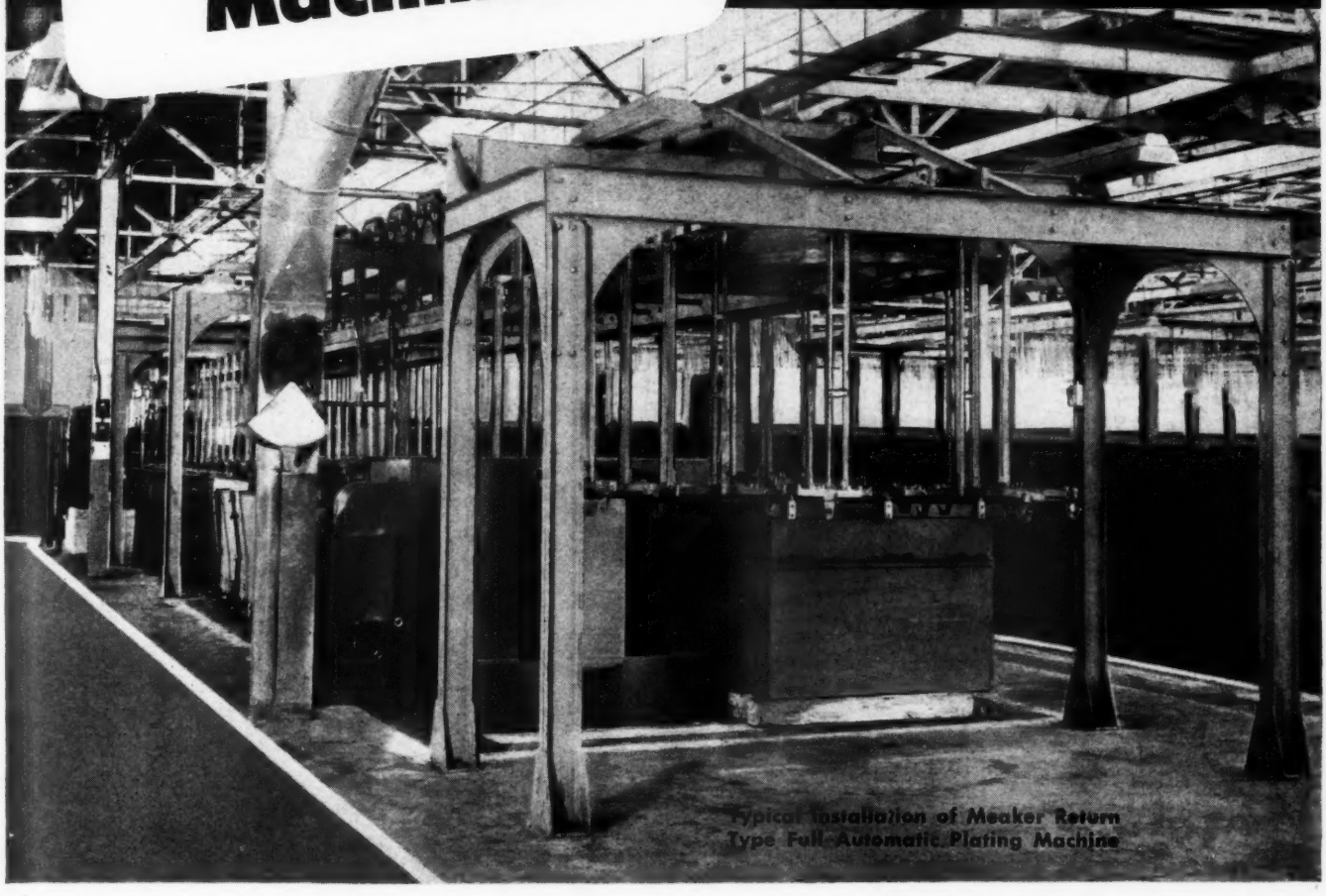

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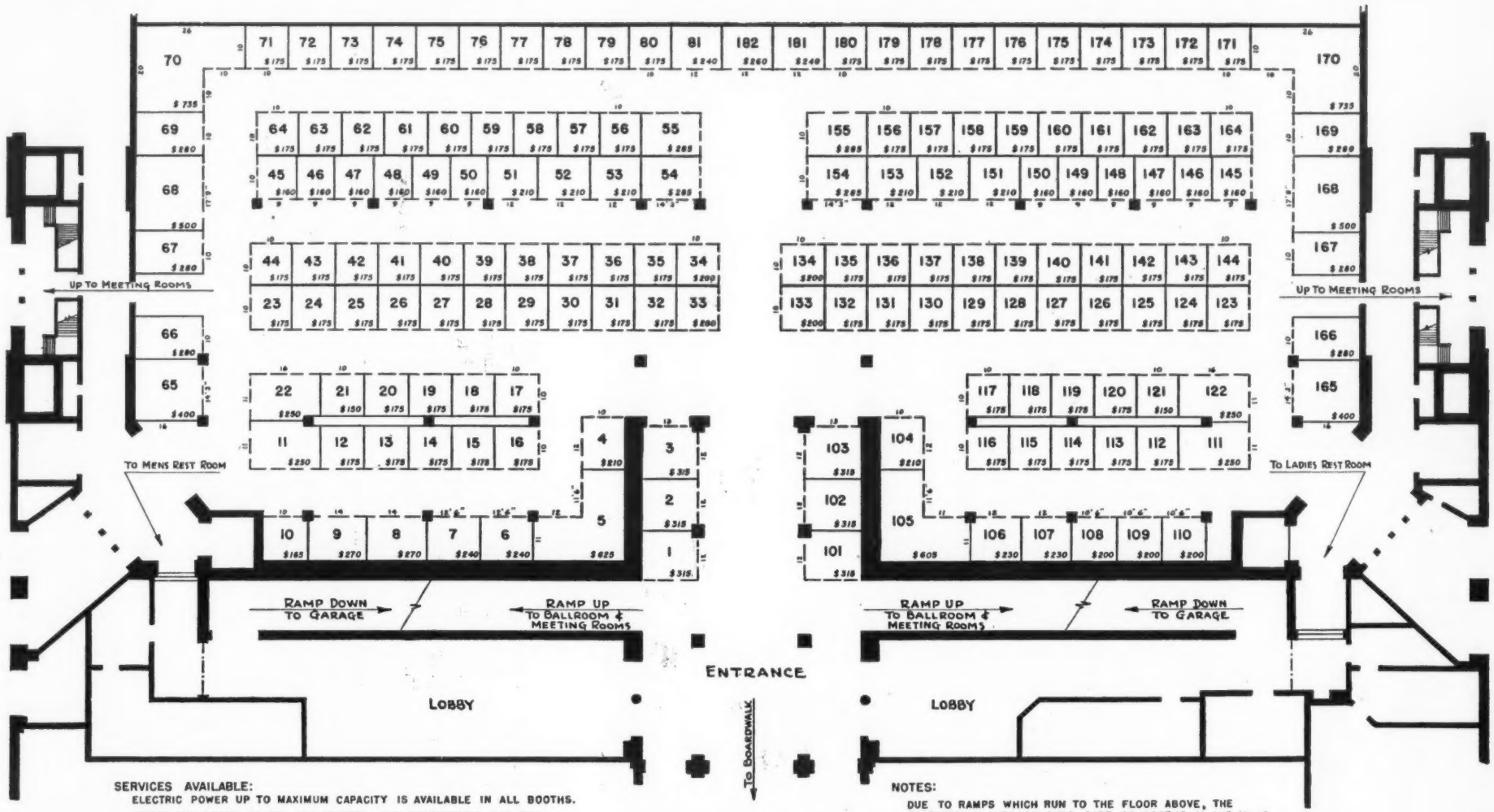

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JUNE 28, 29, 30 AND JULY 1, 1948

1948 CONVENTION AND EXPOSITION

of the American Electroplaters' Society

Plans for the 1948 Convention of the American Electroplaters' Society in Atlantic City, N. J., on June 28 to July 1 are now rapidly maturing.

About ten technical papers on electroplating and allied subjects have been received by Mr. Myron B. Diggin and his Educational Committee, and several more have been promised. Judging from the caliber of the received contributions, the technical and scientific sessions bid fair to become outstanding. The Research Committee will probably sponsor one session devoted to reports of the activities of its many important research projects. A number of these projects have now reached their productive stage, and their findings should be most illuminating. The technical sessions will be held in the large auditorium of the Atlantic City Convention Hall.

The space available for the Industrial Finishing Exposition in the Convention Hall is shown on the appended floor plan. A considerable number of firms engaged in supplying the plating and allied industries with equipment and supplies have already contracted for space and many more have made inquiries. All booths have high capacity electric power outlets, and many booths are furnished with water and drain, steam and steam returns, compressed air, and exhaust ventilation; this makes possible a large number of working exhibits.

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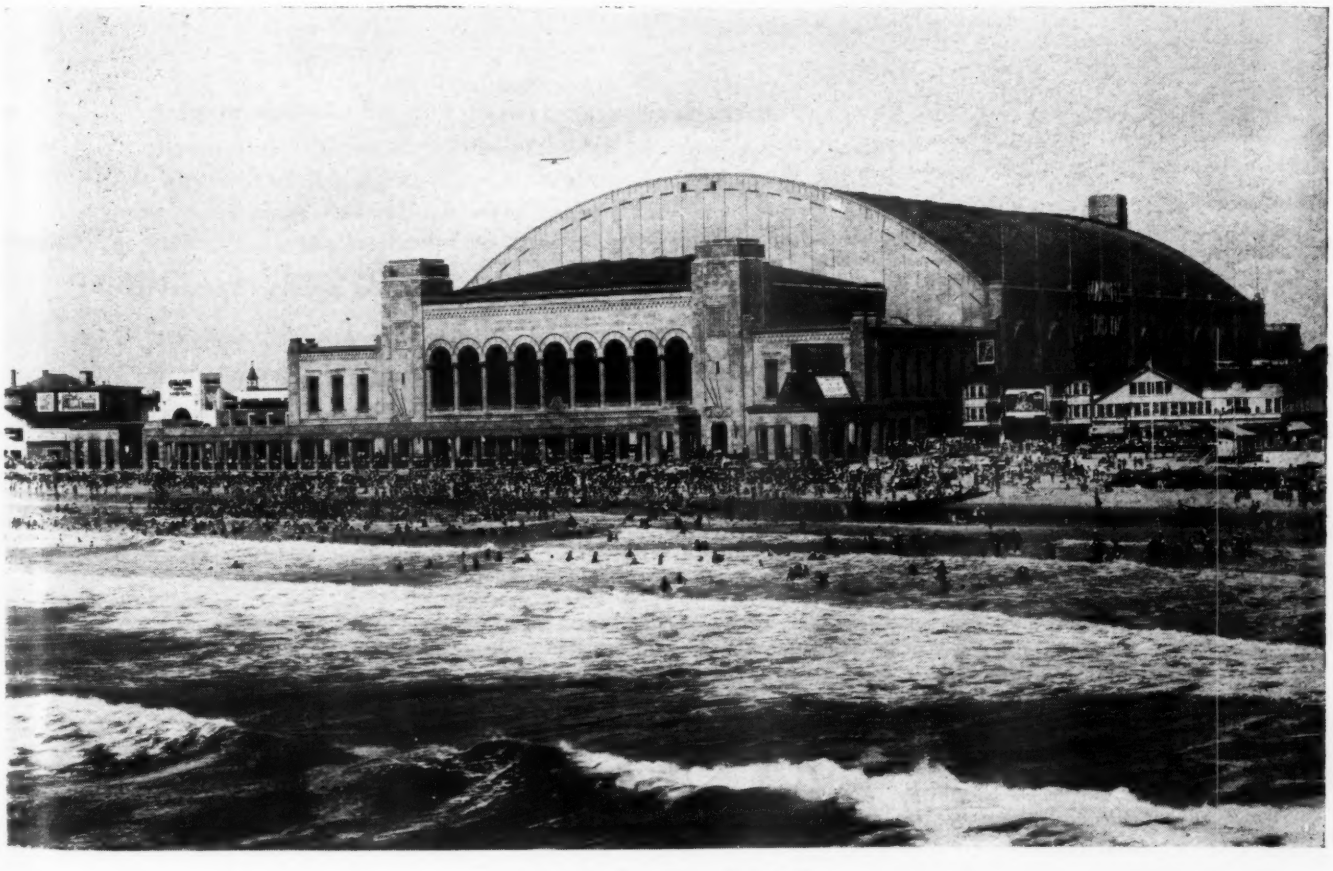

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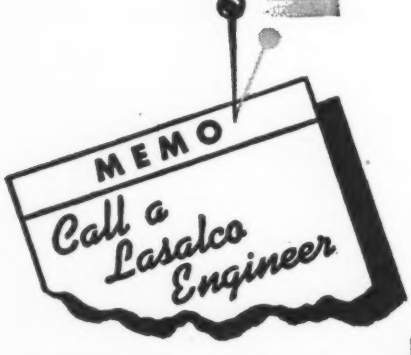

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The Question Box

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Q. 6. What is the best type of scratch brush to use on costume jewelry with a light silver plate over a nickel flash?

A. Use a soft crimped brass wire brush set with wires 0.0025–0.003 inch in diameter. The number of rows, the diameter of the brush, and the spacing of the tufts will depend upon the work being handled. The brushes are used on a slow running lathe (800–1200rpm), and the work is scratch brushed wet using a solution of soap bark and water.—M. B. DIGGIN.

Q. 7. Are there any barrel materials which will stand a stannate tin plating solution without warping?

A. Yes. This has been a serious problem in the past, but a recent application of canvas laminated melamine plastic has proved beyond a doubt that barrels made of this material can be used continuously in hot alkali tin solutions at 180° F and in alkali cleaners without damage to the cylinder. One set of barrels made of such material has been in operation in a complete zinc plating cycle including hot alkali cleaners and acid dips for a period of eighteen months without replacement of panels, heads, or rails.—R. B. SALTONSTALL.

A. Barrels made from a special grade of phenolic resin with a canvas base will withstand alkaline tin plating solutions without warping. This material is said to withstand a temperature of 210° F for an indefinite period of time.—M. B. DIGGIN.

Q. 8. Has anything been done to make possible magnetic measurement of the thickness of copper-nickel deposits on steel?

A. A paper on this subject will appear on National Bureau Standards J. Research for February, 1948 and in PLATING for March, 1948. The modified Magnegage will then be available from American Instrument Company, Silver Spring, Md.—W. BLUM.

Q. 9. What is the significance of the various finish numbers for stainless steel?

A. No. 1 finish is a hot rolled, annealed and pickled finish used on items such as bus treadles, coal chutes, exhaust fans, paper mill equipment, and perforated screens.—No. 2D is a dull cold rolled finish and No. 2B is a bright cold rolled finish resulting from the type of roll used in cold rolling the sheet. Material with the 2D finish is used for cooking ware, deep drawn ware, milk cans, refrigerators, evaporators, steel table insets and thermos bottle liners. Stainless with the 2B finish is used in brewery tanks, cafeteria trays, counter tops, cream separator discs, deep freeze cabinets, flat ware, commercial type sinks and soft drink cooler tanks.—No. 4 finish is referred to as a standard polish finish. It is obtained by the following operation sequence: *1.* Aluminum oxide grit No. 60–80 with a tallow or grease stick on a built-up wheel. *2.* Aluminum oxide grit No. 80–100 with a tallow or grease stick on a muslin wheel. *3.* Aluminum oxide grit No. 100–120 with a tallow or grease stick on a soft muslin wheel. Stainless with this finish is used for architectural purposes, dairy equipment, food processing equipment, photographic equipment, sinks and drain boards, soda fountain and textile dye vats.—No. 6 finish is a standard polish with a tampico brush to remove the sheen. It is obtained by using pumice, lime or silica flour in oil and/or kerosene with a tampico brush of 8 to 16-inch diameter operating at 6,000 to 7,000 surface feet per minute. Stainless of this nature is used for architectural trim, bar equipment, elevator doors, press plates, ice cream cabinet tops, sink and drain boards and soda fountains.—The No. 7 finish is referred to as a high lustre polish. It is obtained by starting with a No. 4 finish, then using as a step *4*, No. 150 Aluminum oxide grit with a tallow or grease stick on a soft muslin wheel, step *5*, No. 240–280 aluminum oxide grit with tallow or grease stick on a soft muslin wheel, and finishing off with step *5B* using stainless buffing compounds on a 12 to 14 inch unbleached muslin wheel operating at 9,000 to 12,000 surface feet per minute. This finish is used on stainless in service for cellophane casting belts, decorative trim and press plates.—No. 8 finish is known as a mirror finish. It is obtained by starting with step *5*, in the No. 7 finish sequence of operations, and adding as step *6*, No. 320–400 aluminum oxide grit with tallow or grease stick on soft muslin wheel, and finishing off with a step *6B* using stainless buffing compounds on a 12 to 14 inch unbleached muslin wheel operating from 9,000 to 12,000 surface feet per minute. Unless specifically mentioned above, the wheels are from 12 to 14 inches in diameter operating at 6,000 to 8,000 surface feet per minute.—K. M. HUSTON.

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Abstracts

For copies of original articles, turn to your Public Library for photostats or addresses of the publications in question.

Character of Roughness on the Surface of Electrolytically Polished Copper. Henri Frisby. Comptes rend. **224,** 1003–1005 (March 31, 1947).

Investigation of electrolytically polished copper directly after removal from the bath showed much less roughness than usual. It is believed that such a surface is subject to oxidation: when left in the air, it became covered, in a few minutes, with several monomolecular layers of cuprous oxide.

Examination of Electropolished Surfaces by Means of Electron Diffraction. J. Trillat. Comptes rend. **224,** 1102–1103 (Apr. 14, 1947).

Examination of surfaces polished electrolytically in a perchloric-acetic acid bath showed that Beilby's film, which is always present on the surface of mechanically polished specimens, disappears after electropolishing.

New Types of Silver Coatings. Peter P. Hopf. Electronic Engineering **19,** 193–194, 198 (June 1947).

Describes an improved silvering preparation and an improved technique for applying printed circuits to nonmetallic, especially ceramic, materials. The material is a stabilized colloid of metallic silver containing a minimum amount of silver oxide. The usual silk-screen printing method is replaced by an offset-printing technique. An alternate method especially useful for application to plastics consists of fusing the silver to the plastic by high-frequency heating.

Tin Coating Meehanite. Anon. Iron Age **159,** 57 (June 26, 1947).

Outlines results obtainable with each of two successful procedures — fused-chloride and fused-nitrate dipping.

Manufacturing Economies Result from Barrel Finishing. Herbert Chase. Materials and Methods **25,** 84–88 (June 1947).

Describes use of barrel finishing to deburr, burnish, hone, and perform other finishing operations on large as well as small parts made of a wide variety of metals

Industrial Wastes. Ind. Eng. Chem. **39,** 559–682 (May 1947).

A symposium consisting of 24 papers. The first four discuss general considerations, the last is an extensive bibliography. Others are devoted to: atmospheric pollution; practices at Dow Chemical Company; waste disposal in pharmaceutical and biological plants, corn-

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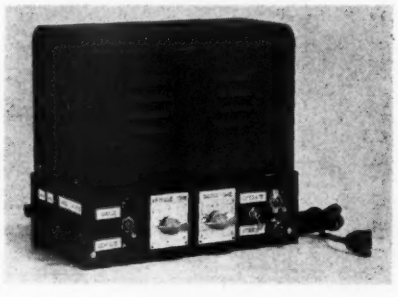

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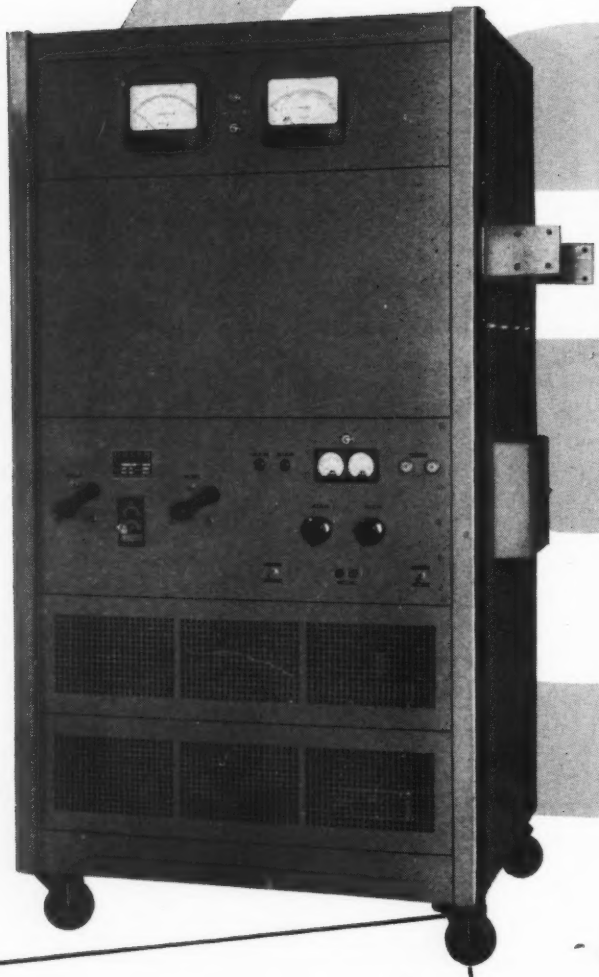

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Evaluation of Synthetic Detergents. Anon. Soap and Sanitary Chemicals **23,** 69, 71, 151 (May 1947). Gives results of a study of a number of surface-active agents with respect to their physico-chemical properties and detergent ability.

Smoothing Action as a Mechanism in Bright Nickel Plating. G. E. Gardam. J. Electrodepositors' Tech. Soc. **22,** 155–168 (1947).
Some nickel solutions deposit a greater thickness of plate in small scratches and pits than they do on the higher points. This results in a more nearly plane surface and is termed "smoothing action." Photomicrographs show that nickel solutions containing some zinc, cadmium, or iron have a strong smoothing action. Bright nickel solutions containing no added metal as an ingredient have shown a similar smoothing action but on a much smaller scale. The theoretical and practical aspects of these phenomena are discussed. Tables and graphs are presented.—LYMAN B. SPERRY.

Electrolytic Polishing of Magnesium. George Black. Metal Finishing **45,** 86–87, 94 (June 1947).
Presents in detail some of the methods for anodic polishing of magnesium alloys as described in British patents.

Dyeing Anodized Aluminum (Concluded). J. P. Gill. Metal Industry **70,** 340–341 (May 9, 1947).
Describes method used and selection of dyestuffs. 13 ref.

Contribution to the Study of Electropolishing Processes. R. Piontelli, D. Ports, and L. Arduini. Metallurgia Ital. 3–11 (January-February 1947). (Reprint.)
Describes a new experimental installation for the study of electropolishing processes permitting a very convenient reproduction of the anode voltage curve as a function of time, current density, etc. The mechanism of the process, with specific reference to the influence of both composition and conditions of electrolysis, is discussed.

Silicone Resins in Protective and Decorative Finishes. Progress Report III. Official Digest, 144–153 (March 1947).
Describes results of additional evaluation research. Among the characteristics shown by photographs are: color retention at high temperatures; resistance to

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various acids, alkalies, gasoline, alcohol, etc.; and resistance to shock and bending. Compatibility with various pigments was also evaluated.

Plastic Resins as Protective Coatings (Concluded). Paul O. Blackmore. Organic Finishing **8,** 30–33, 36–38 (June 1947).
Discusses alkyds; urea and melamine; acrylics; polystyrene; vinyls, vinylidene chloride; and silicones.

The British Welding Research Association Symposium on the Welding of Light Alloys: Methods of Surface Preparation of Light Alloys for Spot Welding. F. C. Dowding. Sheet Metal Industries **24,** 1232–1236, 1238 (June 1947).
First progress report discusses: contact-resistance measurements; surface preparation of duralumin and of aluminum-magnesium alloys; the effect of scratch brushing and surface roughness; preparation of magnesium-base alloys; the cleaning of Alclad with post etch; and pickling solutions for aluminum-base alloys.

Bright Zinc Plating Cuts Cost at Philco Plant. Clarence W. Smith. Iron Age **160,** 46–50 (July 10, 1947).
Use of bright zinc plating on sheet-metal radio and television set parts in place of cadmium had resulted in savings of $100,000 per year at the Philco Corporation's Philadelphia plant. Equipment and procedures used in applying this finish rapidly and efficiently are described in detail.

Electrodeposited Silver on Steel for Glass-to-Metal Seals. Norman S. Freedman. 11 pp. Electrochemical Society Preprint **91-19** (1947).
Describes the development of a glass-to-silver-plated steel "disk" type seal used in the manufacture of electron tubes designed for high-frequency operation. A plating process that produces a layer of silver on steel which satisfactorily withstands high-temperature processing. Tests indicate that the bond is improved when diffusion between the silver and the iron takes place.

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Weathering Effects on Magnesium Coatings. Loring R. Williams and George W. Sears. Light Metal Age **5,** 10–11, 22 (April 1947).
Studies were conducted in western Nevada because of its altitude, extent of sunshine, and wide daily temperature range. Several commercial surface coatings were used in the study. They were applied to magnesium alloy sheet of the following composition: 3.5 per cent Al, 0.1 per cent Mn, 1.3 per cent Zn, and 95.1 per cent Mg. Outlines preparation of test plates; weathering tests; observations made during the weathering period, and observations made at the end of the test.

The Influence of Crystal Face on the Electrochemical Properties of a Single Crystal of Copper. Henry Leidheiser, Jr. and Allan T. Gwathmey. 11 pp. Electrochem. Soc. Preprint **91-6** (1947).
Importance of crystal face in several electrolytic processes in a copper sulfate-sulfuric acid solution were investigated with the aid of electrolytically polished single crystals of copper and found to be of great importance. The nature of the surrounding atmosphere also influenced the physical form of the electrodeposit.

Overvoltage Required for Evolution of Hydrogen at High Current Densities. A. G. Pecherckaia and V. V. Stender. J. Applied Chem. (U. S. S. R.) **19,** 1303–1312 (1946).
Overvoltages necessary were determined for an extensive series of metals at a series of current densities from 10^{-3} to 1.0 amp/sq cm. Results are tabulated, charted, and compared with those found in the literature. 26 ref.

Influence of Surface-Active Organic Compounds on the Kinetics of the Cathodic Deposition of Tin. M. Loshkarev, V. Sotnikova, and A. Krinkova. J. Phys. Chem. (U. S. S. R.) **21,** 219–229 (1947).
Influence of a series of additives on the kinetics of cathodic deposition of tin from sulfuric acid solution was investigated. It was established that the addition of slight amounts of alpha- and beta-naphthols, xylenols, thymol, diphenylamine, or tribenzylamine results in polarization, which increases with simultaneous addition of colloidal substances. 18 ref.

Electroplating Non-Conductors. Thomas A. Dickinson. Metal Finishing **45,** 95 (June 1947).
Describes procedures for plating of plastics and other non-metallics with copper, black-nickel, chromium, and gold.

Sealing Lead Coatings by Shot Blasting. Anon. Metco News **4,** 14–15 (July 1947).
Describes investigation which showed that a light undercoat of Metcoloy No. 1 or 2 or of Sprasteel No. 10 would permit shot blasting of sprayed lead coatings without destroying the bond. The shot blasting sealed the coating, providing perfect protection of the steel.

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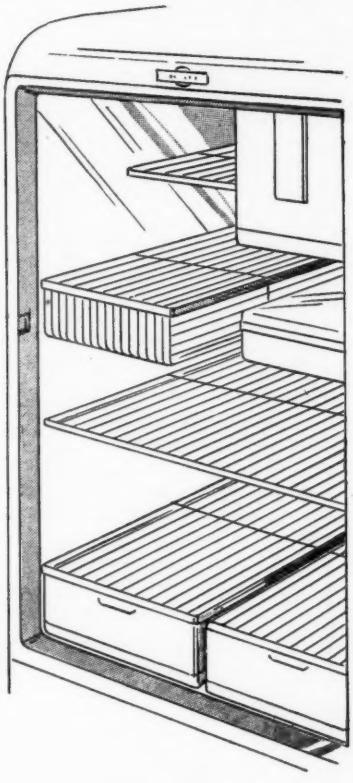

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Plating Smallwares. Parts I and II. R. Macmair. Metal Industry **70,** 423–425 (June 6, 1947); 464–466 (June 20, 1947).
The finishing of small articles by barrel polishing and barrel plating is described in this series. The type of equipment available, the abrasive media used, the preparation of the work, methods of scale removal, and the barrel polishing of cast iron, mild steel, bright steel articles, and small brass die-castings are discussed.

Electrochemical Jet Test. A. Ogarev. Metal Industry **70,** 338–340 (May 9, 1947).
Describes a method for determination of thicknesses of electrodeposited coatings. A direct current is passed through the stream of liquid flowing through a capillary onto the sample, the latter being made the positive and the capillary the negative electrode. At the spot where the jet meets the sample, electrochemical solution of the plated metal takes place. When the base metal is exposed, a marked change of current strength takes place which indicates the end point.

The Phosphate Treatment of Metals Prior to Painting. H. A. Holden, J. Oil and Colour Chemists' Assoc. **30,** 61–72 (March 1947).
Illustrated article describes the principles, procedures, types of process, and advantages of the above. Reviews work of the National Bureau of Standards and of the British Standards Institution.

A Simple Technique for the X-Ray Determination of Fiber-Axes in Electro-Deposited Metals. M. R. J. Wyllie. Review of Scientific Instruments **18,** 425–429 (June 1947).
Describes a special camera designed for this purpose and a method of computing the numerical value of the fiber-axis of the orientated crystals from simple linear measurements on the films obtained with this camera.

Magnesium Copper Sulfide Rectifiers — Their Operation and Characteristics. R. O. Whitesell. Product Engineering **18,** 84–89 (June 1947).
Physical and electrical properties, characteristics, and uses are explained and interpreted. Nature of semiconductors, behavior of rectifying layers, electrical characteristics of the cell, factors influencing aging and failure, and general application relationships are included.

The New Dilute Cronak Process. Michael H. Bruno. Modern Lithography **15,** 51, 79, 81 (April 1947).
Tells how the Cronak process converts the surface on zinc electroplates to an inert substance which does not corrode. Dilute Cronak is a modification which produces a much lighter color and uses only one-tenth the amount of bichromate. The technique of the process is described.

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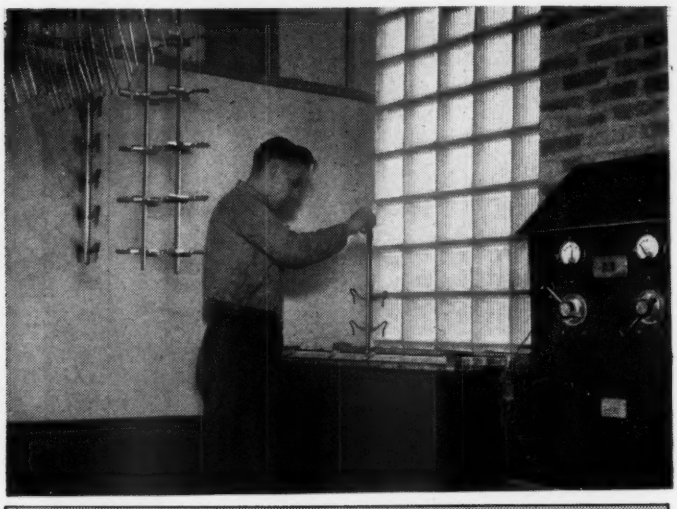

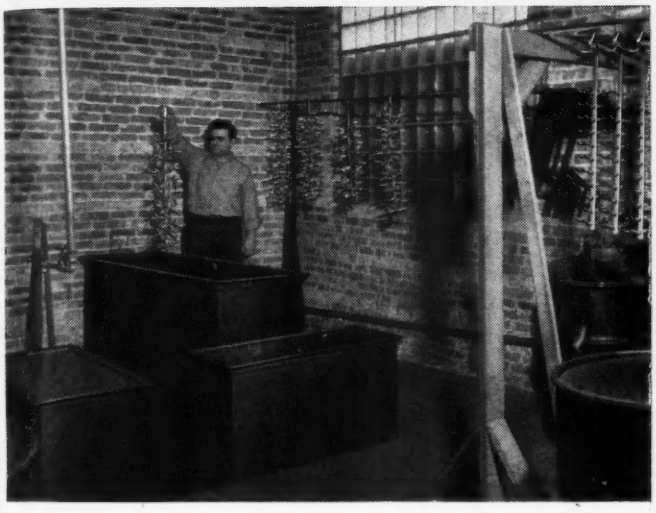

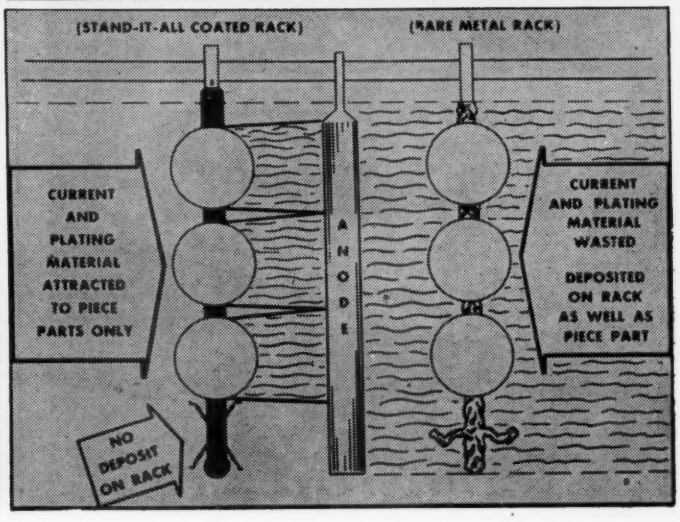
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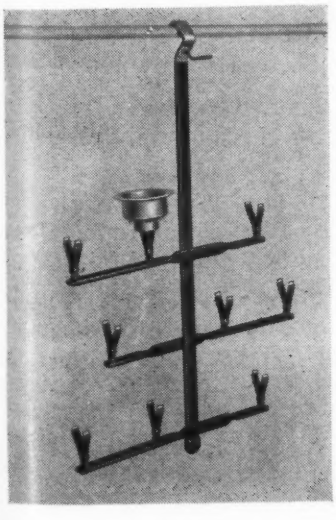

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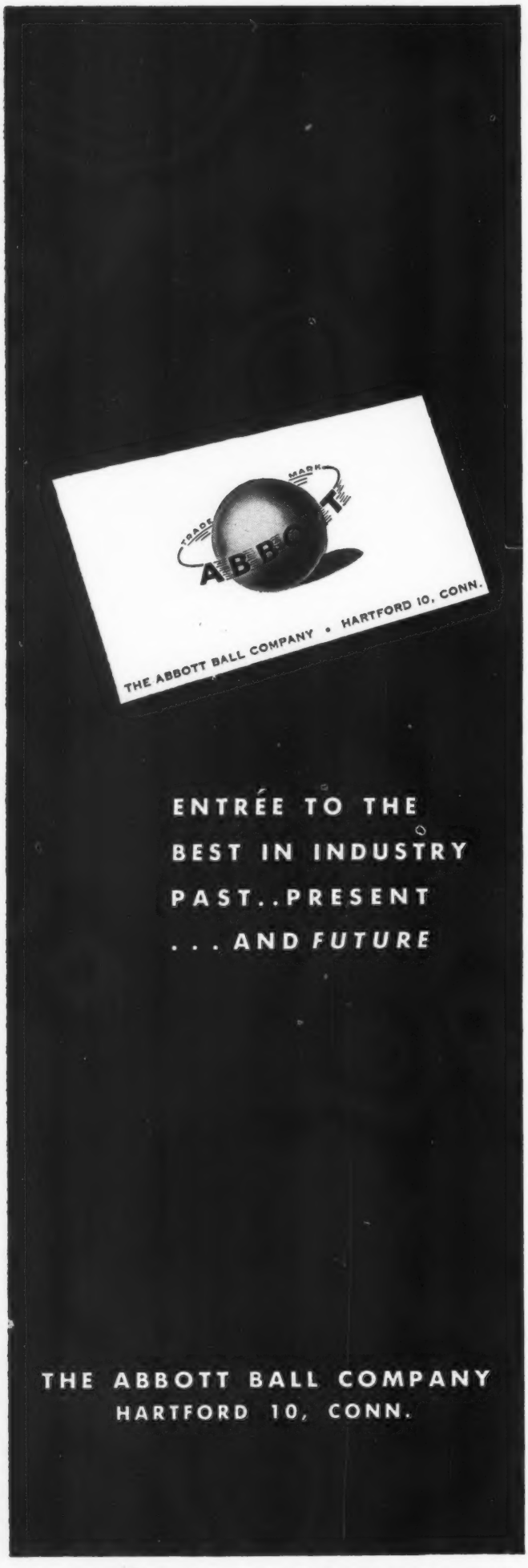

Patents

By GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

No. 2,431,947, December 2, 1947—Formation of a Strong Bond between a Ferrous Metal Surface and an Electrodeposit of Silver—W. M. Marz, assignor to General Motors Corporation.

This invention relates to a process of forming a high strength bond between an iron or steel surface and an electrodeposit of silver.

In the production of a silver plated steel surface (such as, for example, steel backed silver plated bearings) it has been the practice first to electrodeposit a plating of a metal such as copper or nickel and then to electrodeposit the silver onto the copper or nickel.

Broadly stated, the invention includes anodic treatment of the iron or steel surface with a phosphoric acid solution, and subsequent plating the silver directly to the treated steel surface. Wetting agents of various kinds, compatible with the phosphoric acid solution, may be used in it. Best results are obtained when the parts are given a cyanide dip prior to silver plating and when the silver plated parts are annealed.

Claim 1. A process of producing a strongly bonded electrodeposit of silver directly onto a steel surface which includes electrolytically cleaning said surface in an alkaline solution, washing said cleaned steel surface, anodically treating said washed steel surface in a solution composed of approximately equal volumes of phosphoric acid and water for from 30 to 60 seconds, the acid solution being operated at a temperature from about room temperature up to 150° F and at an anode current density of 5 to 150 amperes per square foot, rinsing said anodically treated surface, then dipping said treated surface in an aqueous cyanide solution composed of approximately 100 grams per liter of an alkali metal cyanide of the class consisting of sodium cyanide and potassium cyanide for about 10 to 20 seconds, striking a silver plate onto said surface in a bath composed of 1.5 to 2.5 g/liter of silver cyanide and 150 g/liter of potassium cyanide (free), the bath being maintained at a temperature of 75 to 90° F, a current density of 15 to 20 amperes per square foot being employed and the time being from 10 to 30 seconds, then electrodepositing a silver plating of desired thickness in a silver plating bath maintained at 100 to 125° F and containing 130 to 150 g/liter of silver cyanide, 160 to 180 g/liter of potassium cyanide (free) and 10 to 20 g/liter of potassium hydroxide, and thereafter annealing the silver plated steel surface at a temperature of 400 to 1200° F for 30 to 120 minutes in a non-oxidizing atmosphere.

2 claims.

References Cited in File: U. S. Patents Nos. 2,104,269, January 4, 1938, to Oplinger; 1,916,503,

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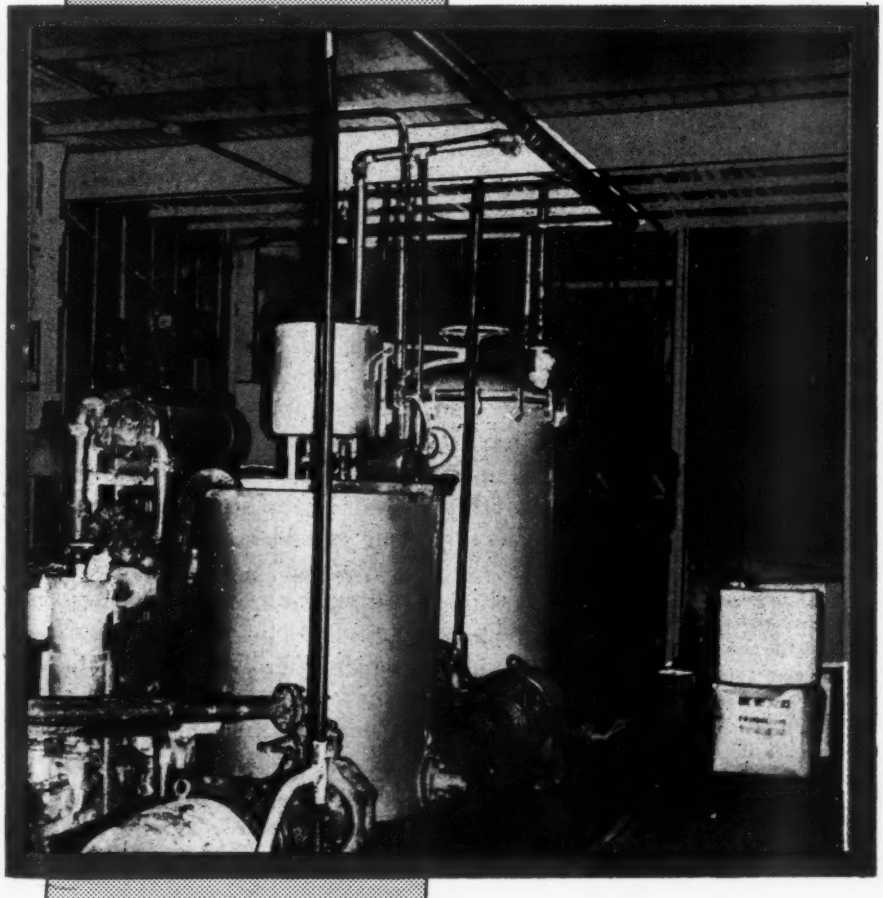
To obtain quality plating on a production basis requires plating solutions that are clean. The presence of impurities in solutions means an increase in the amount of rejects. Proper filtration is the economical way to increase your production and keep it on a quality basis. Plating shops that operate on a large scale day in and day out, know the value of keeping their solutions free of impurities. That is why Industrial Filters are the first choice of platers who are quality minded.



At left — Industrial filter system on brite nickel installation in a large automotive plant.

This arrangement consists of filter, pumping unit, primer-strainer unit, mixing tank, control valves, fittings and piping.

These features facilitate the convenient use of filter aids and purifying agents, making it an ideal continuous filtration system, and equally as effective for intermittent filtering. Systems are provided for either acid or alkaline solutions.

For 20 years "Industrial" has been building filters for plating solutions that have enjoyed an outstanding reputation for dependability, low upkeep cost, long life and bed rock operating economy. That is why so many platers say "I prefer the Industrial way."

INDUSTRIAL FILTER & PUMP MFG. CO.

1621-39 WEST CARROLL AVENUE • CHICAGO 12, ILLINOIS • TELEPHONE SEELEY 3631-3-4-5

Whatever your problem in finishing zinc or cadmium, there's an Iridite* to do the job. Iridite, a quick-dip, chemical treatment, offers you these three advantages—

Radio and hardware parts, permanently brightened with Iridite.

1. EYE APPEALING FINISH

On plated parts Iridite forms a long lasting, sparkling *bright* finish that *stays bright,* even after handling, storage, exposure. On all surfaces, Iridite can be used to produce a variety of colored finishes.

Wire cloth and galvanized bucket, Iridited for extreme corrosion-resistance.

2. RUSTPROOFING . . .

Resistant to the attack of water, gasoline, and ordinary corrosive conditions, Iridite provides the ideal *final finish* for all zinc and cadmium surfaces.

Hardware products, Iridited and painted for peak finishing system efficiency.

3. BASE FOR PAINT . . .

On any zinc or cadmium surface that must be painted, Iridite insures a better finishing system because the coating improves initial paint adherence, blocks corrosion *under* paint, blocks formation of metallic soaps *between* paint and metal.

● **Tell us the type of finish you need for zinc or cadmium—let us tell you how Iridite can help. For information and samples, write to:**

ALLIED RESEARCH PRODUCTS, INC.
401 Chemical Building
4004 EAST MONUMENT STREET ● BALTIMORE 5, MD.
Manufacturers of *REG. U.S. PAT. OFF.

IRIDITE

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL AREAS

176 [FOR FURTHER INFORMATION, USE SERVICE READER CARD; INDICATE A 108.

July 4, 1933, to Wilson; 2,197,653, April 16, 1940, to Wilson; 1,658,222, February 27, 1928, to Burns; 2,277,664, March 31, 1942, to Hull; 1,995,766, March 26, 1935, to Chester; 1,949,713, March 6, 1934, to Gravell; 1,909,149, May 16, 1933, to Hitner.

Trans. Electrochem. Soc. **74**, 284, 287–304 (1938).

Trans. Electrochem. Soc. **82**, 109 (1943) (in discussion of "The Adherence of Thick Silver Plate on Steel" by H. L. Crosby and L. I. Gilbertson).

H. Strow, "Metal Cleaning in Wartime." *Monthly Rev. Am. Electroplaters' Soc.* **29**, 996 (1942).

No. 2,431,948, December 2, 1947—Apparatus for Electrodepositing Metal on Bearing Shells and the Like—W. M. Marz, assignor to General Motors Corporation.

CLAIM. An apparatus for electrodepcsiting metal on the inside of a stack of bearing shells and the like which comprises a generally cup-shaped support having a base and upwardly extending walls of generally circular shape, the upper portions of said walls adapted to engage in liquid-tight relation and support a stack of bearing shells connected together to form a tubular cathode, said base having an opening centrally arranged therein, a tubular anode having an upper portion within the tubular cathode, an intermediate portion within the cup-shaped support and a lower portion extending through said opening, said upper portion being spaced from said tubular cathode to form an annular passage for electrolyte between said tubular cathcde and said upper portion, said intermediate portion being spaced from said walls and forming therewith a passage of annular shape, said annular passages thus being connected together, said lower portion being in liquid-tight engagement with said opening, an annular plug in the annular passage between said intermediate portion and said walls at a point between said base and upper end of said walls, said plug having angularly arranged jet openings adapted to impart a spiral effect to the electrolyte as it flows therethrough, a cap in liquid-tight engagement with the upper end of said tubular cathode and spaced from the upper end of said tubular anode, means for flowing electrolyte into said annular passage below said plug, then upwardly through the angularly arranged jet opening, then spirally upward through said annular passageway formed between upper portion of said tubular anode and said tubular cathode to the upper end of the cathode and then downwardly through the tubular anode, and means for passing electric current from the tubular anode to the tubular cathode through the electrolyte flowing spirally upward in said annular passageway between the two.

REFERENCES CITED IN FILE: U. S. Patents Nos. 1,259,683, March 19, 1918, to Van Hasselt; 686, 395, November 12, 1901, to Dessolle; 2,297,252, September 29, 1942, to Schmidt; 1,886,218, November 1, 1932, to Olin; 1,594,509, August 3, 1926, to Rosenquist; 588,740, August 24, 1897, to Becker; 1,872,290, August

16, 1932, to Hitner; 1,927,162, September 19, 1933, Fiedler et al. Swiss Patent No. 215,409, November 3, 1939. French Patent No. 825,071, November 27, 1937.

No. 2,432,718, December 16, 1947—Tin Plating Process —N. F. Blackburn, assignor to E. I. du Pont de Nemours & Co.

An object of the present invention is an improved process for electrotinning from alkali metal stannate solutions. A further object is to improve the process of electrotinning from a potassium stannate bath. Another object is to provide means for increasing the anode current efficiency in electroplating tin from a solution containing potassium stannate . . . It has now been discovered that high concentrations of carbonate are deleterious in potassium stannate baths and that unusually high concentrations of 15 to 30 ounces per gallon of potassium carbonate are advantageous in potassium stannate plating baths in increasing the anode current efficiency without appreciably affecting cathode current efficiency.

An example of a suitable mixed stannate plating soluton is:

	Grams per liter
Sodium stannate, $Na_2Sn(OH)_6$	120
Sodium hydroxide, NaOH	20
Potassium carbonate, K_2CO_3	120
Molar ratio i. e.: Na+to K+ = 0.8 to 1	

CLAIM. A tin plating process which comprises electroplating with anodes consisting of an alloy of tin and sodium containing about 0.1 to 10 per cent by weight of sodium in a water solution consisting of 120 grams per liter of sodium stannate, 21 grams per liter of potassium hydroxide and 120 grams per liter of potassium carbonate at a temperature of 90° C, an anode current density within the range 100 to 200 amperes per square foot and a cathode current density of not less than 200 amperes per square foot.

REFERENCES CITED IN FILE: U. S. Patents Nos. 1,841,978, January 19, 1932, to Oplinger; 2,406,189, August 20, 1940, to Blackburn. German Patents Nos. 299,794, July 26, 1922; 471,281, February 9, 1929. *Trans. Electrochem. Soc.* **82**, 77–100 (1942); **84**, 205 (1943).

No. 2,432,893, December 16, 1947—Electrodeposition of Nickel-Tungsten Alloys—M. L. Holt and M. L. Nielsen, assignors to P. R. Mallory & Company, Inc.

A great deal of interest in the electrodeposition of tungsten and tungsten alloys has been in evidence in recent years but apparently none of the methods tried have been found suitable for commercial practice.

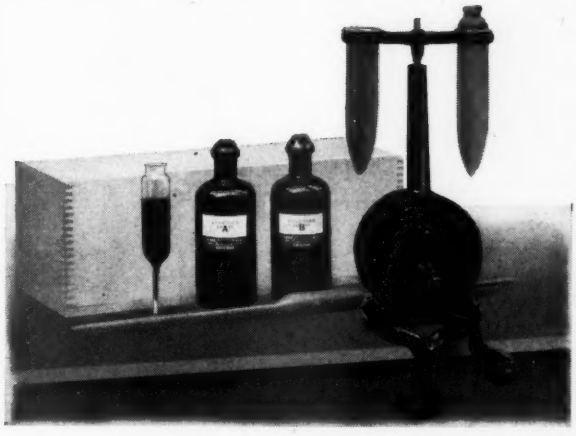
It was applicants' belief that a nickel electrodeposit containing small percentages of tungsten would show advantages over pure nickel for many commercial applications and would also have utility in many cases where pure tungsten or high tungsten alloys have heretofore been thought necessary.

KOCOUR

SULFATE TEST SET

for determining

Sulfates in Chromium Solutions



This apparatus enables anyone to accurately and quickly determine the sulfate content of a chromium plating solution.

For consistently good plating results, the ratio of sulfates to chromic acid must be maintained within very definite limits so that a constant check must be kept.

This is easily accomplished with this equipment and we can also supply sets for quickly ascertaining the chromic acid and trivalent chromium content.

We also manufacture test sets for analyzing other plating solutions, cleansers, pickles, anodizing baths, for determining the thickness of zinc, cadmium, copper and tin deposits and for pH determination.

Write for literature or contact your local jobber

KOCOUR CO.

4801 S. ST. LOUIS AVE. CHICAGO 32, ILL.

LOOK AT PERM-A-CORE

"It's got something no other buff has got"

- Cuts Better
- Buffs Better
- More Versatile
- Less Waste
- More Economical

Here's a buff that's distinctly different in design, construction, and method of application. It steps up production . . . wears better . . . lasts longer . . . saves buffing compound. You can make it hard or soft as necessary . . . for fast cuts — heavy cuts — light cuts — cut and color — or just for color only — on all metals and most plastics. See the PERM-A-CORE BUFF . . . try it . . .

Ask for Free Demonstration

"the Buff that Breathes"

Designed for efficient centrifugal ventilation — one of the many exclusive Perm-a-core features.

PAT. NO. 2,122,609

Manufactured by ADVANCE POLISHING WHEELS, INC.
An Affiliate of THE MATCHLESS METAL POLISH COMPANY
734 BLOOMFIELD AVE., GLEN RIDGE, N.J. • 840 W. 49TH PL., CHICAGO 9, ILL.

Do you buy CORROSION PROTECTION BY THE GALLON? BY THE FOOT? OR BY THE YEAR?

THE photograph above shows two sections of a ceiling within 15′ of one another. The badly corroded area had been coated with one of the better industrial coatings. The one that looks as good as the day it was put on is coated with Tygon plastic Paint .. They both were exposed to the same conditions.

Frankly, you can buy "protective" coatings at a lower cost than Tygon; you can buy coatings that cover more feet per gallon. But you'll find it hard to buy real protection "by the year" at a cost anywhere near as low as you'll pay for Tygon protection.

For Tygon Paint doesn't chemically deteriorate with age; its tough, flexible, chemically-resistant film sets up a virtually impenetrable barrier against corrosion; stands up against the toughest conditions in your plant, month after month.

● *Write for a free test panel and the interesting new 16-page booklet "How to Use Tygon Paint for Longer Maintenance-Free Plant and Equipment Life."*

TYGON PAINT

Tygon Paint is pure Tygon plastic in a solvent vehicle; applied cold by spray gun or brush; air dries quickly to form a tough, flexible, impact-resistant plastic film; resists most acids, alkalies, oils, water, alcohols; available in white, black, gray, green, red, aluminum and clear.

U. S. STONEWARE

Akron 9, Ohio

One suitable nickel-tungsten bath contained

	Grams per liter
Nickel sulfate, $NiSO_4.6H_2O$	250
Nickel chloride, $NiCl_2.6H_2O$	21
Boric Acid, H_3BO_3	30
Sodium tungstate, $Na_2WO_4.2H_2O$	4

The *p*H of the bath was adjusted to about 3 and the plating was carried out at a temperature between 40° and 50° C and a cathode current density of between 0.5 and 1 ampere per square decimeter.

The anode was of nickel.

CLAIM 8. In the art of electrodepositing a nickel-tungsten alloy, the steps which consist in passing current between an anode and a cathode through a modified Watt's bath containing nickel sulfate, nickel chloride, boric acid, and sodium tungstate, maintaining the sodium tungstate content of the bath at such a value as to provide a tungsten concentration within the range of 0.2 to 16.0 grams per liter, operating the bath at a *p*H within the range of 2.0 to 5.4, and controlling the tungsten concentration and *p*H so as to produce a metallic deposit.

8 claims.

REFERENCES CITED IN FILE: U. S. Patent No. 2,160,321, May 30, 1939, to Armstrong et al.

Trans. Electrochem. Soc. **78**, 399–400 (1940); **82**, 193–203, 217–226 (1942).

No. 2,432,894, December 16, 1947—Electrodeposition of Iron-Tungsten Alloys—M. L. Holt and R. E. Black, assignors to P. R. Mallory & Company, Inc.

An electrodeposit of iron containing small percentages of tungsten can provide a highly desirable facing for many commercial applications, such as where a hard or abrasion resistant surface is desired. It also has some advantages where corrosion resistance is required.

A current density of between 8 and 12 amperes per square decimeter is preferred for still baths and results in a deposit containing 8 to 12 per cent by weight of tungsten.

CLAIM 1. The method of electrodepositing an iron-tungsten alloy which comprises passing an electric current through a bath consisting of an aqueous solution of 350 g of ferrous ammonium sulfate, 1 g of sodium tungstate and 3.5 N sulfuric acid in one liter of solution, said solution having a *p*H of about 2.0, and the electrodeposition being performed at about 75° C.

2 claims.

REFERENCES CITED IN FILE: U. S. Patent No. 2,160,321, May 30, 1939, to Armstrong et al.

Trans. Electrochem. Soc. **82**, 205–226 (1942).

The Improved "MUNNING" Table Buffing Machine

SIMPLIFIES SURFACE FINISHING of "HARD-TO-HANDLE" SHEETS

Specially designed for easier handling of sheets—plates—slabs—flat stock; either metallic or non-metallic that are flexible, heavy, unwieldy or too large to be worked manually

THE IMPROVED MUNNING & MUNNING TABLE BUFFING MACHINE

produces desired finishes by the use of proper wheel, cutting or color composition.

Buffing table is operated mechanically, pneumatically or by magnetic chuck. Table may be raised to compensate for buffing wheel wear. It is completely insulated against heat distortion.

The following machine specifications are optional: Hand or automatic control • Rack or chain drive • Single or multiple buffing wheel spindles • Automatic buffing composition feeds.

Send for Bulletin 45-1 for complete details

MUNNING

MUNNING & MUNNING INC.

Manufacturers of Electroplating, Buffing, Polishing Equipment and Supplies

202-208 EMMETT STREET, NEWARK, N. J.

Woolworth Building, New York City • Bourse Building, Philadelphia

190 Wyndham Avenue, Providence, R. I.

Industry News

Industrial Lining Engineers, Inc., Sewickley, Pa., has recently expanded its line of established products and services to include products manufactured by Belke Manufacturing Company, Crown Rheostat and Supply Company, General Electric Company, Wyandotte Chemical Corporation, United Chromium, Inc., Sparkler Manufacturing Company, Manderscheid Company, American Buff Company, Nelson Chemical Company, Duluth Buff Company, Alsop Engineering Corporation, Kirk and Blum Manufacturing Company, Platecoil Division of Kold-Hold Manufacturing Company, and other leading manufacturers of plating equipment and supplies.

The newly created Electroplating Sales Division, headed by W. B. WILLIAMS, is now in a position to offer sales and service, engineering, and faster deliveries of all plating and finishing room equipment and supplies. Such a service has not before been available in the Eastern Central states. Stocks of many products are carried in the Sewickley warehouse for immediate delivery. It is the intention to carry local stocks of all equipment and supplies in steady demand by customers.

The Foxboro Company, Limited, officially moved into its handsome and spacious new building in the Ville La Salle section of Montreal, on November 19. It is the largest plant in Canada devoted to the manufacture and sale of industrial instruments.

The Foxboro Company, Limited, affiliated with the Foxboro Company, of Foxboro, Mass., was established in March, 1933, and until the present time has occupied space in the buildings of Peacock Brothers, Limited, who for more than thirty years have been Foxboro's sales representatives in Canada and Newfoundland. Steadily increasing volume of business, both in the domestic and export markets, has long demanded larger quarters, but plans for the new building were halted by the war. Ground was broken a year ago, and the plant is now in nearly complete operation. The Foxboro Company, Limited, manufactures virtually the entire line of Foxboro instruments of measurement and control. MR. JOHN H. BOLTON, Manager, continues in charge.

J. B. Ford Division of Wyandotte Chemicals Corporation recently distributed gold watches to eight representatives in recognition of their twenty-five

years of service to the Company. They are, first row, left to right: EDWARD J. WILEY, Springfield, Ill.; MARLIN T. LARGE, Salt Lake City; CARL W. LANGE, Grand Rapids; ELSIE WIEDUWILT, secretary, Philadelphia; ROSE LINDEMANN, secretary, Wyandotte; WILFRED B. SMITH, Providence; S. V. ALEXANDER, Louisville, and CLAYTON C. CAMERON, Detroit.

CARTER B. ROBINSON, Vice-President in Charge of Sales, J. B. Ford Division, was toastmaster at the 1947 Service Award Banquet and is seen in the center of the second row. On Mr. Robinson's right is E. M. FORD, President of Wyandotte Chemicals. On his left is W. F. TORREY, Senior Vice-President.

Gerity-Michigan Corporation is the new name of the company previously known as Gerity-Michigan Die Casting Company, the change having been voted by stockholders at their annual meeting. James Gerity, Jr., President, in announcing the action, explained that the former name had not been descriptive of the scope of the company's business, inasmuch as it is engaged in plating and finishing as well as die casting. The company also is an important producer of bathroom accessories.

Stockholders also voted to hold the annual meeting in Adrian instead of Detroit, the executive offices having been transferred to the former city some months ago.

A PLATER STRIPS THRU FEBRUARY
THOMAS A EDISON FEB-11
WHY SO LATE, ALVA?
THIS SURE IS A RACKING PROBLEM-AFTER ELIMINATING OXIDATION OF THE ELECTRODES WE SHALL HAVE ELECTRIC LIGHT SO I CAN SAVE ON MIDNITE OIL AND START A NITE SHIFT!
ABE LINCOLN FEB 12
HIS PROBLEM WAS TO KEEP A HOUSE DIVIDED FROM FALLING
A CASE OF POOR ADHESION!
NATCH!
WILL YA?
VALENTINE DAY FEB 14
LEAPYEAR
COMPLETE COVERAGE
YES FATHER - I FIGURED IT WAS THE PROPER SOLUTION WITH CONTROLLED POWER TO ELIMINATE A TERRIFIC TREE BUILD UP IN THIS AREA!
G WASHINGTON FEB 22
- BUT WHY DOES THE BOSS ALWAYS WIN THE DISCUSSION ON "THROWING POWER"?
- HE KNOWS JOE WILL ASK FOR MORE CURRENT SEE!
STAMP
DOSTALE

ELECTROPLATING FUNDAMENTALS— how operating efficiency affects plating costs

Typical Life-Time Efficiency curve of ELECTRIC PRODUCTS motor-generator

The cost of electricity may seem an insignificant part of overall plating costs . . . until you figure it on an annual basis.

Biggest determining factor in annual current cost is the operating efficiency of the generating equipment. Consider the case of a 4,000-ampere, 9-volt motor-generator that has an efficiency of only 55% and which operates 3000 hours a year at a cost of 1½ cents per kw-hr. of electricity. If the machine had an efficiency of 75%, *the User would save $765 per year.*

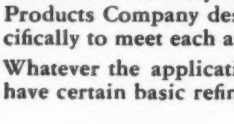
E.P. motor-generators, 2500 amperes and above, have a full-load efficiency of 75% or better—higher than equivalent non-rotating equipment. Most important, however, this figure represents sustained, life-time efficiency.

When selecting your electroplating equipment, keep efficiency in mind. Remember that motor-generators *stay* young; continue to deliver plating current at minimum cost.

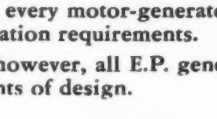
why EP motor-generators are best . . . for every application

Standardized design cannot meet the varying demands of electrolytic service. That's why The Electric Products Company designs every motor-generator specifically to meet each application requirements.

Whatever the application, however, all E.P. generators have certain basic refinements of design.



POLE SPACERS



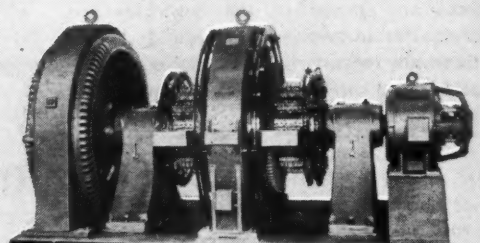
MICROMETER ADJUSTMENT OF INTERPOLES

These two features typify the craftsmanship you'll find in E.P. Products. Poles and interpoles are precisely aligned and adjusted to assure sparkless commutation and longer brush life.

For thirty-five years The Electric Products Company has been studying the requirements of electrolytic operations. E.P. has pioneered practically every new development in the electrolytic motor-generator field for many years.

Specify E.P. motor-generators to assure reliable operation unmatched by any other source of direct current.

WRITE FOR BULLETIN 202. It describes the entire line of E. P. Motor-Generators for the Electrolytic Processes.



Every part of an E.P. Motor-Generator is readily reached for inspection and maintenance particularly important with relation to the bottom brushes. E.P. equipment requires no special protective equipment. Thirty-four years of operating experience prove that these Motor-Generators function safely under the extreme conditions common to most electrolytic operations.

EP

THE ELECTRIC PRODUCTS COMPANY

1721 CLARKSTONE ROAD CLEVELAND 12, OHIO

Job Shop Operations

According to the December issue of the Monthly Bulletin of the Masters' Electro-Plating Association, New York City, rate of operations in December was 59 per cent against 62 per cent in November, 1947 and 79 per cent in December, 1946.

Frederic B. Stevens, Inc., of Detroit Mich.—one of the country's oldest and best known distributors of foundry and metal finishing equipment and supplies, full and semi-automatic plating machines, buffing and polishing lathes—announces the removal of its general offices and warehouse to new and larger quarters.

In its new location at 1800 Eighteenth Street at Vernor Highway West, the Company will enjoy greatly expanded facilities, with more than double the floor space previously occupied. An adjoining building is now being altered and will, within a few months, be used as a buffing composition factory.

W. J. Cluff, President, extends a cordial invitation to all customers and friends to visit the new plant.

New Equipment and Supply House Incorporation of K & R Industries of Bridgeport, Conn., has just been announced. The officers are all well known in the plating and finishing field.

Morris Kenes, President, formerly Foreman of the Grinding and Welding Department of the Automatic Machine Company, for many years was Sales Engineer for The Eagle Belt Lacer Company. He has a thorough knowledge of the design and manufacture of plating racks.

Harry Rishor, Treasure specializes in the construction of plating equipment.

Lawrence Griffin, Vice-President specializes in Sales Engineering.

K & R Industries design and manufacture plating equipment and are sales representatives for various manufacturers of plating and finishing compounds and accessories.

The Jacob Hay Company, 4014 W. Parker Avenue, Chicago, Ill., is handling the complete line of Speedie Buffing and Polishing Compounds in Northern Illinois and Wisconsin according to an announcement by **The Buckeye Products Company**, Cincinnati 16, Ohio, manufacturers of Speedie Compositions.

The Jacob Hay Company is not only in a position to recommend the proper type of Speedie Composition for any type of buffing and polishing job but, to expedite deliveries, is maintaining in its Chicago warehouse a stock of Speedie Tripoli, Stainless Steel, Chrome, Nickel, Emery Cake, Grease Stick and Satin Finish.

In the Rochester, N. Y., area, Speedie Buffing and Polishing Compositions are handled by Scobell Chemical Company, in the Detroit area by A. T. Wagner Company, and on the West Coast by E. B. Dunn Company, Los Angeles, Calif.

If you're finishing parts with JUST PLAIN ZINC ... better read this!

You've probably noticed that, despite today's grab-bag markets, more and more complaints are coming in on untreated zinc parts. Assemblers are demanding protection on all their zinc plate items — from refrigerator shelves to small tools; from fasteners to radio chassis.

So, for a protective treatment that will pass your customer's approval use Luster-on* inhibited zinc bright dip. Inexpensive, easy to use Luster-on* makes any zinc plate passive. A simple Luster-on* dip at the end of your plating line gives your product a finish that is permanently bright, rust- and corrosion-proofed — that even resists handling-smudges and fingermarks. Once your product is cold-dipped in Luster-on* there's no danger of spoiling its overall beauty or utility value.

If you're using ordinary zinc plating you certainly owe it to yourself to investigate Luster-on* further. First in its field, Luster-on* is first in results too! Send the coupon and a sample for processing today. No obligation!

THIS BOLT, with ordinary, untreated zinc plating, is dull—lusterless, subject to corrosion.

THIS IS THE SAME BOLT after a Luster-on* dip. The Luster-on* cost for permanent protection and bright finish — one-thirtieth of one cent! Bolt size ⅜" x 4".

WHICH BOLT WOULD YOU BUY?

Kemo says:

You can solder to a Luster-on surface, too. Simply use our Never-Sever Solder Flux.*

81

*REG. U. S. PATENT OFFICE

THE Chemical CORPORATION

54 Waltham Ave., Springfield 9, Mass.

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield, Mass.

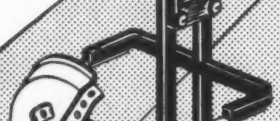
Please send me full particulars about Luster-on* bright dip for zinc-plated surfaces. I am (am not) sending sample for free dip. No obligation, of course.

Name_____

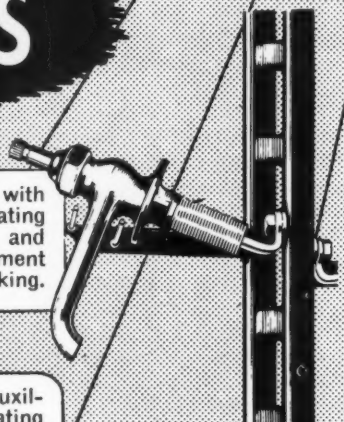
Firm_____

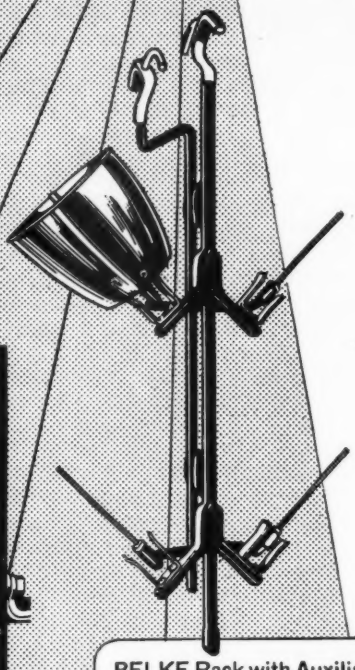
Address_____

Belke
TIME-SAVER
PLATING RACKS



Section of BELKE Rack with Auxiliary Anodes for Plating Faucets — Contact tip and auxiliary anode arrangement affords fast, efficient racking.





BELKE Rack with Auxiliary Anode for Chrome Plating Reflectors. Auxiliary anode slips thru hole in reflector assuring fast and easy racking. Tips contact non-critical area on reflector.

Section of BELKE Rack with Auxiliary Anode for Hard Chrome Plating the Inside of Dish-shaped Machined Parts. Heavy spring tips extend thru center of auxiliary anode to hold article by non-critical area. Racking and unracking are fast and easy.

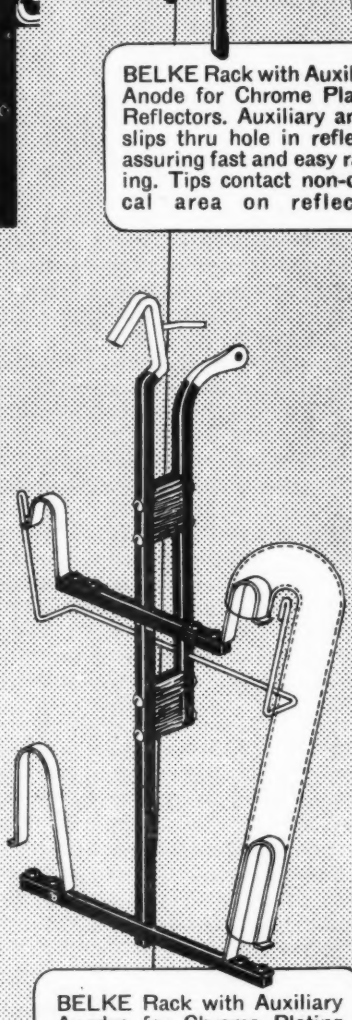
Racking Problems Solved!

Whatever your Rack Requirements—
for large, medium or small parts
for plating, anodizing or electro polishing
for semi-automatics, full automatics or still tanks
for plating, pickling or cleaning solutions
BELKE has the Experience, Specialized Facilities and Know How to give you unequaled racking efficiency.

Just send specifications, sketch or sample part for the BELKE Recommendation.

The Most Complete Rack Manual Ever Produced

100 pages of experienced-proved information. Practical construction methods. Insulations. 560 Proven Designs of Racks, Tips and Hooks. 144 illustrations of Racking Methods—shows how to rack all shapes and sizes from jewelry to bumper bars. Price $5.00 postpaid.



BELKE Rack with Auxiliary Anodes for Chrome Plating Plumbing Elbows. Tips hold elbows in proper relation to auxiliary anodes and afford fast, efficient racking and unracking.

BELKE MANUFACTURING COMPANY

947 North Cicero Avenue Chicago 51, Illinois

Equipment & Supplies

E—13. **Ready-to-Use Cement**—The abrasive cement made by Stanton Products Company, 2055 W. Lake Street, Chicago, Ill., is claimed to grip all grains, from grade 60 to 320, and ready to use for setting up polishing wheels, belts and discs for polishing of all metals. It is packed in cans of 1 quart and 1 to 5 gallons, also in drums of 30 to 55 gallons. For additional information, use Reader Service Card.

E—14. **Triad PRD Coating Compound for Spray Booths**—A new coating compound for use on the walls of paint spray booths has just been announced by Detrex Corporation, Box 501, Detroit 32, Mich. Useful for facilitating maintenance of both wet and dry spray booths, it is said to have characteristics that make it especially advantageous for use on the walls of dry booths.

Triad PRD is a light-colored, semi-liquid material that is applied to the booth walls with a brush or spray gun. The dried coating forms a continuous white coating to which paint overspray adheres. When necessary to clean the booth, the coating of Triad PRD with adherent paint film is readily scraped off without previous soaking, or it can be easily removed by flushing with either hot or cold water. Paint overspray adhering in a solid film can be peeled off in a sheet. There is no fire or health hazard in the application of this material. For further information, use Readers Service card.

E—15. **Periodic Reverse Plating Electronic Relay.**—Production of a low-cost electronic relay timer for periodic reverse plating is announced by Platers Research Corporation, 59 E. 4th Street, New York 3, N. Y. It may be connected to either a generator or rectifier. Its capacity is 10 amperes on the plating line. Plating time cycle is up to 20 seconds with the reverse plating cycle time up to 5 seconds. Any combination within these ranges may be obtained by simple adjustment of two control knobs.

A switch is provided to permit conventional plating only if desired. An additional standby switch is provided so that where plating is interrupted the unit remains ready to operate, thus eliminating the usual warm-up period required by all electronic equipment.

This small inexpensive unit will enable platers to experiment with periodic reverse plating which has aroused wide interest among platers. For further information, use Reader Service Card.

E—16. **Foam Blanket Chips**—Foam blanket chips for suppression of foam in all types of aqueous solutions, especially chromium plating baths, are announced by Industrial Lining Engineers, Inc., Sewickley, Pa.

The chips float on surface of solution, thereby reducing the exposed solution surface, and by their motion mechanically destroy foam as it is formed. The mobile blanket so formed will readily part to permit work to be introduced or withdrawn from the bath. While it does not retard evaporation, it will materially reduce foaming, frothing, priming difficulties, and spray losses.

The chips are approximately 2 inches long, 1 inch wide, and 1/16 inch thick with a slight curvature to prevent them from clinging to wet tank walls or to work and racks traversing the bath. They are resistant to all acids, except hot concentrated nitric, all alkalis, inorganic salt solutions, and organic solvents operating at temperatures up to 230° F. For further information, use Reader Service Card.

E—17. **Steel Surface Conditioners.**—Surbrite S and Surbrite H, acid inhibitors for sulfuric and muriatic acid solutions developed by the Hanson-Van Winkle-Munning Company, Matawan, N. J., which were in short supply during the war, are again readily available.

Since they have the additional property of wetting or lowering surface tension and the ability to cause the pickled steel to develop a bright, smut-free surface, they are designated as "steel surface conditioners".

Surbrite Foam is a product to be used with Surbrite H and Surbrite S when very heavy pickling operations are being carried out. Since the "steel surface conditioners" do not completely eliminate the formation of hydrogen, a considerable amount of spray may be produced in very heavy pickling. Surbrite Foam is said to produce a foam which will blanket the solution and prevent the escape of spray. For additional information, use Reader Service Card.

E—18. **Selenium Rectifier.**—A new 9 volt, 2,500 ampere selenium rectifier has just been introduced by the Bart-Messing Corporation, 45 Morgan Avenue, Brooklyn. This unit was primarily designed to provide a reserve of voltage for platers desiring to use diluted solutions of chromic acid or other baths to conserve their limited supplies of critical materials.

Among the features are efficiencies over 72 per cent at full load up to 83 per cent at 20 per cent load, tap switch adjustment of output to provide voltage adjustment without breaking current to the tank,

ROTO FINISH
Trademark Reg. U. S. Pat. Office

DOES CUT PRODUCTION COSTS

ELECTRICAL MFR. WRITES . . . . . .
(Name on File)

"The savings effected in this one job alone are outstanding. Roto-Finish has enabled us to increase the production of one assembled unit from 94 units per day to 300 per day by releasing five regular operators who ordinarily would be assembling the units from a tedious filing job."

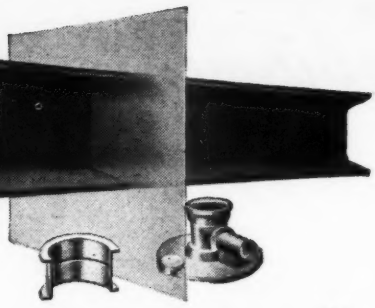
Unretouched illustration shows copper segment at top before Roto-Finish deburring and finishing; below after Roto-Finishing.

Roto-Finish is a mechanical deburring and finishing process — producing staggering savings in labor costs over manual operations. One operator can finish quantities of parts uniformly and accurately in a fraction of the time required by hand. Roto-Finish likewise removes a job that is tedious, time consuming and distasteful to employees. It eliminates need of elaborate, costly dust control systems. Send samples of die castings, sand castings, stampings, machined parts, forgings for processing. (Include finished part for guide.) No obligation!

THE STURGIS PRODUCTS CO.
403 JACOB ST., STURGIS, MICHIGAN

ROTO-FINISH
THE ENGINEERED
MECHANICAL FINISHING PROCESS

FOR DEPENDABILITY



... Specify "GENERAL CHEMICAL"

CHEMICALS FOR THE METAL INDUSTRIES

ELECTROPLATING

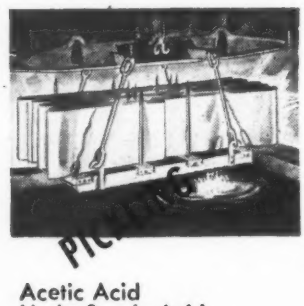
Acetic Acid
Ammonia Alum
Ammonium Thiosulfate Solution
Aqua Ammonia
Chromium Fluoride
Fluoboric Acid
Hydrofluoric Acid
Hydrogen Peroxide
Metal Fluoborate Solutions
Muriatic Acid
Nitric Acid
Potash Alum
Potassium Cyanide
Sodium Fluoride
Sodium Metasilicate
Stannous Chloride
Sulfuric Acid
Tetrasodium Pyrophosphate
Trisodium Phosphate

STEEL

Rimming Steel Manufacture
Sodium Fluoride

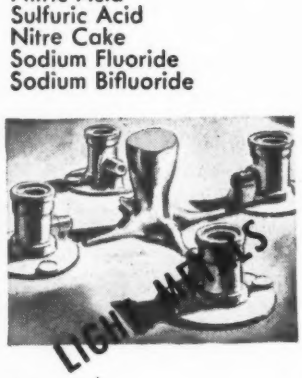
Steel Manufacture
Sodium Bisulfite, Anhydrous
Sodium Sulfite, Anhydrous
Sulfur
Iron Sulfide

Descaling
Glauber's Salt
Sulfuric Acid



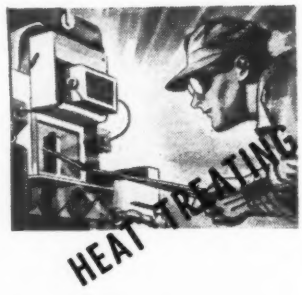
PICKLING

Acetic Acid
Hydrofluoric Acid
Muriatic Acid (Hydrochloric)
Nitric Acid
Sulfuric Acid
Nitre Cake
Sodium Fluoride
Sodium Bifluoride



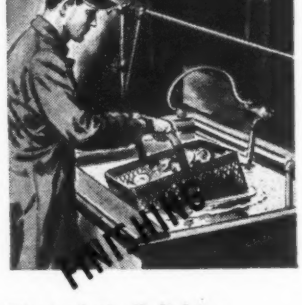
LIGHT METALS

Casting
Ammonium Fluoborate
Potassium Fluoborate
Sodium Fluoborate



HEAT TREATING

Barium Fluoride
Sodium Fluoride
Potassium Fluoride
Potassium Cyanide



PAINTING

Electrolytic Polishing
Acetic Acid
Perchloric Acid
Sulfuric Acid
Hydrofluoric Acid

Bright Dipping
Hydrofluoric Acid
Nitric Acid
Sulfuric Acid
Muriatic Acid (Hydrochloric)

Oxide Finishing
Copper Sulfate
Hydrofluoric Acid
Nitric Acid
Oxalic Acid
Sodium Silicate
Sulfuric Acid

Galvanizing
Sodium Fluoride
Hydrochloric Acid
Sulfuric Acid

ALKALI CLEANING
Aqua Ammonia
Sodium Silicate
Trisodium Phosphate (TSP)
Tetrasodium Pyrophosphate, Anhydrous
Sodium Metasilicate

FOR METAL ANALYSES
BAKER & ADAMSON
LABORATORY REAGENTS
AND FINE CHEMICALS

BASIC CHEMICALS
FOR AMERICAN INDUSTRY

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

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In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

triple impregnation of selenium elements for corrosion protection, positive overload protection, and magnetic starter and push buttons. The caster-mounted unit is 68 inches high x 26 inches deep x 38 inches wide. For additional information, use Reader Service Card.

E—19. Dust Hoods for Wheel and Belt Polishers.—Torit Manufacturing Company, Walnut and Exchange Streets, St. Paul 2, Minn., now offers hoods adaptable to the various buffing lathes and idlers on the market. The hoods are said to be especially sturdily constructed and yet within the price range of those now being used. Different designs are available for different machines. For further information, use Reader Service Card.

E—20. Centrifugal Pumps for Corrosive Liquids. — Centrifugal process pumps designed for severe wear and specially suited to handle corrosive and severely abrasive liquids are offered by Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis.

Parts subjected to severe wear are all separate pieces and can be easily replaced Adjustable clearance insures maintenance of capacity and efficiency without dismantling the pump and permits operation for long periods without repairs. Available in five sizes with capacities up to 1300 gpm at 275 foot heads. For further information, use Reader Service Card.

E—21. Rossaul Copper-Brite—A new solution for bright dipping of copper and copper alloys has just been introduced by the Rossaul Company, 119 W. 63rd Street, New York 23, N. Y.

Copper-Brite is said to remove oxides and leave the metal bright and shiny, resistant to future tarnish or discoloration. Being non-toxic, non-fuming, it is claimed to be safe for workers to handle. Used at room temperature in acid resistant still tanks, Copper-Brite requires only a dip and clear water rinse. Only five seconds of immersion are required for a bright dip; three minutes for removal of heat scale. It will not discolor silver solder. For further information, use Reader Service Card.

E—22. Chemical Spray Suppressor for Chromium Plating Baths—R. O. Hull & Company, Inc., 1279 W. 3rd Street, Cleveland 13, Ohio, now have available a unique product, No-Cro-Mist, which when added in small amounts (1½to 4 gallons per 1000 gallons) to chromium plating baths is said to control the evolution of spray or mist. The resultant advantages are said to be that health conditions in the plating room are greatly improved, remarkable savings are possible in decreasing building heating costs by using the minimum ventilation on the chromium tanks, rack carriers in full or semi-automatic machines are kept clean and up to 95 per cent of the chromic acid (estimated at 1/3 to 2/3 of the total consumption) usually lost in the ventilating system is saved. Operation of the bath is claimed not to be affected by the addition of No-Cro-Mist. For further information, use Reader Service Card.

E—23. Compact Tank Heaters—It is now possible to manufacture heated tanks with a completely flat interior surface and without protruding coils. The new units, manufactured by Platecoil Division, Kold-Hold Manufacturing Company, Lansing, Mich., called "Platecoil", have a flat surface on one side and are embossed on the other to form channels for the circulation of the heating agent. This construction is said to reduce the weight per square foot, simplify installation, and provide more cubic content per given tank and therefore more productive capacity. The smooth surface is easily cleaned. When repairs are needed, the unit can often be removed, discarded, and replaced without "shutdowns".

The coils can be furnished in steel with metalized surfaces of various metals, or in monel, stainless steel or other specified metals. They are available as plates, in bank form, or fabricated into complete liners where the conditions warrant. Each plate is production tested at 180 pounds per square inch. For further information, use Reader Service Card.

E—24. Improved Wrap-Rax Tape—The Hanson-Van Winkle-Munning Company, Matawan, N. J., announces that it is now in a position to supply customers' insulating tape requirements with an improved Wrap-Rax masking and stop-off tape which is said to provide even greater thermal and chemical resistance to all kinds of electroplating and anodizing solutions. It may be rapidly applied, after which it is heated to 300 to 325° F to insure adhesion at each lap of the winding. Many manufacturers have used the new Wrap-Rax without fluxing where service conditions are not severe, for example, in room temperature baths. When the tape is used in this way, the laps should be wider than usual, the wrapping tighter and the final lap, in addition to being cemented, should be tied down to insure retention of tension. For further information, use Reader Service Card.

E—25. Parker Develops Metal Cleaners—A new line of metal cleaners has been developed by the Parker Rust Proof Company of Detroit, it is announced by Van M. Darsey, president of Parker. The new cleaners have been thoroughly tested in the Company's own laboratories and in production runs, and are now available to manufacturers of metal products throughout the country. The three classes of Parco Cleaners for steel, zinc, and aluminum include emulsion types, acid types, and alkaline types. They are specialized cleaners to meet varying specifications and conditions. Parco Cleaners are formulated to make hard water suitable for cleaning, to rapidly remove soil from metal surfaces, to condition them for fine, dense Bonderite coatings, to remove rust and grease prior to painting, and to provide easier control and greater economy. For additional information, use Reader Service Card

E—26. Announce Repackaging Plan—Behr-Manning announces a new trade-built repackaging plan—Service Packaging of Coated Abrasives—effective on shipments after January, 1948.

Said to have required two and one-half years of study and research into the buying, selling, handling and use habits of its distributors, dealers and consumers, the new Service Packaging program is described by Behr-Manning as ". . . a planned, 'tailored' method of packaging coated abrasives in such proper quantities, weights and invoice values, and in such readily identified containers and wrappers, as to best serve the functional needs and habits of our distributors, dealers and consumers alike." For additional information, use Reader Service Card.

POSITION WANTED

Electro- and metallurgical chemist, M.S., age 42, desires responsible executive position in research, development, and/or control laboratory. At present with well-known firm, desires greater opportunity. Excellent background of experience in metal finishing work. *Send Replies to:*

P-2A PLATING

P. O. Box 168, Jenkintown, Pa.

SALESMAN WANTED

Leading manufacturer of buffing compounds desires a man who is experienced and has a following in the buffing and polishing field. Prefer someone living in the territory to be assigned, namely Pennsylvania, South Jersey and Delaware. Attractive drawing account for right man. *Send Replies to:*

P-2B PLATING

P. O. Box 168, Jenkintown, Pa.

EXPERIENCED ELECTRO-PLATER

High school education or better preferred. Practical experience essential. To supervise plating standard hardware plated finishes on small steel parts. *Reply to:*

P-2C PLATING

P. O. Box 168, Jenkintown, Pa.

MONEY IN YOUR POCKETS *at the Finish!*

DULUTH BUFFS

have a way of saving you a lot of money . . . because those square sewed pockets you see hold the abrasive and cut down on waste . . . and besides, that sewing keeps the buff from wearing out too soon. The finer the stitching, the faster the cut.

WRITE FOR COMPLETE INFORMATION TODAY

ah! but there's Only One

DULUTH BUFF COMPANY

CHICAGO 16, ILLINOIS

New Literature

L—8. Buffing and Polishing Compounds—Production men looking for a complete line of buffs and polishing compounds will find catalog sheets issued by E. Reed Burns Manufacturing Corporation, 48 Withers Street, Brooklyn, N. Y., of great value in their selection. Included are polishing wheels, pastes, rouge and other compounds. For your copy, use Reader Service Card.

L—9. Protective Coatings—A 12-page catalog giving complete details on the chemical and physical properties, applications and other pertinent data on protective coatings has been published by Amercoat Division, American Pipe and Construction Company, P. O. Box 3428 Terminal Annex, Los Angeles 54, Calif. For your copy, use Reader Service Card.

L—10. Plating Barrels—Mercil Type—Bulletin PB 107 is a new 20-page barrel catalogue issued by the Hanson-Van Winkle-Munning Company, Matawan, N. J. It covers a wide range of plating barrels, from the small single-unit jewelers, apparatus to the large multiple-unit production installation. Special points of interest are new developments, including a pumping apparatus for circulating the solution, the new Merlon cylinders for resistance to a variety of solutions, and the new sizes of barrels with dimensions given for inside measurements as well as styles having outside measurements.

Other features include all types of contacts; triple tie-rod hanger; tanks, motor drives; portable and horizontal barrel units; multiple cleaning, plating and rinsing equipment; hoists; hopper units; loading and transfer stands; exhaust arrangements; oblique barrels (single and multiple cylinder units); variable speeds, etc. For your copy, use Reader Service Card.

L—11. Presto Buffs—The newly issued Presto Bulletin 106 describes the complete line of Bias Type, Loose, Concentric Sewed, Radial Sewed, Spiral Sewed and many other Presto buffs manufactured by The Manderscheid Company, 810 Fulton Street, Chicago 7, Ill. Also included is information on recommended usage, construction details, and available sizes. For your copy, use Reader Service Card.

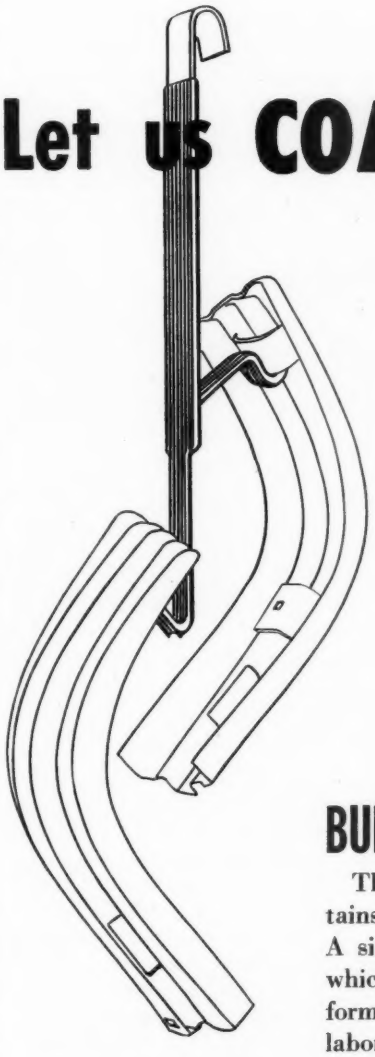
L—12. Power Brushes—A new three-color, 76-page Brush Catalog No. 200, designed to simplify selection of the best brush for the individual job, has just been issued by The Osborne Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio. It presents numerous illustrations of industrial brushing operations in addition to photographs and description of Osborne's complete line of power, paint, varnish and maintenance brushes.

A three-page section is devoted to actors involved in selecting the right brush for specific jobs: operating equipment requirements, brush characteristics, operating conditions, surface speeds, and other helpful information regarding brush usage. For your copy, use Reader Service Card.

L—13. Safety Clothing—Industrial Products Company, 2820 N .Fourth Street, Philadelphia 33, Pa., has issued a bulletin which deals exclusively with safety clothing, describing gloves, aprons, sleeves, etc., along with sizes and prices. For your copy, use Reader Service Card.

L—14. Dust Eliminator—A new catalog has been released by Schmieg Industries, Inc., 300 Piquette Avenue, Detroit 2, Mich., pertaining to its line of dust and fume eliminators. Containing blueprints and drawings, along with photos, it fully and completely describes the operation and uses of the products. For your copy, use Reader Service Card.

Let us COAT your racks



Paste insulation is thick and very tough and has long insulation life.

We are now prepared to give custom rack insulation service on any make or type of rack, using the new BUNATOL Paste Insulation. For long insulation life and freedom from trouble, Paste Insulation is the lowest in cost-per-hour of use. Ship your racks to Toledo for service.

NEW RACKS TO ORDER

Let us figure on your new rack requirements, with or without insulation. You are assured of correct design and construction to handle your production on the lowest cost basis. Get our prices on new racks.

BUNATOL PASTE INSULATION

This new insulation is 100% solids and contains no inflammable or evaporating liquids. A single dip produces a heavy thick coating which must be baked to convert to the solid form. No shrinkage—No loss. Reduced labor cost. If you have an oven to bake racks you can insulate your own racks profitably. Write for complete data.

NELSON J. QUINN COMPANY

TOLEDO 7, OHIO

Personals

Samuel G. Baker was promoted to general manager of the Electrochemicals Department of the du Pont Company, effective January 1. He succeeds F. S. MacGregor, who has retired after a successful career of thirty-one years.

He had held a variety of positions with the company when he, in 1934, joined the Electrochemicals Department as director of the Electroplating Division, becoming Assistant General Manager of the department in 1945.

Clark

David N. Clark has joined the Research and Development Laboratories of the United States Stoneware Company, Akron, Ohio, as Research Chemist. He has received his A.B. degree, Ohio State University, 1941; M.A., Princeton University, 1943; and Ph.D., Princeton University, 1947. He has served in the Navy, as well as conducted research at Princeton under the auspices of the Committee for Medical Research, O. S. R. D. and N. D. R. C. at Columbia University. He was until recently with Firestone Laboratories as Research Chemist in plastic development.

Frederick P. Hauck was elected vice-president and director of Michigan Abrasive Company at a recent board meeting, Max C. Jones, company president, announced.

Hauck first was associated with Michigan Abrasive as a technical consultant. After several years in this capacity, he was induced to devote his full time as Factory Manager in charge of production and research.

Born in New York City, Hauck has a Chemical Engineering degree from New York University.

J. M. Howard has been named to the recently created post of General Manager of the Industrial Finishes Division at the company's Stamford, Conn., plant, E. H. Bucy, General Manager of the Cellulose Products Department, Atlas Powder Company, has announced. Mr. Howard formerly held the position of Director of Sales. In his new capacity he will have full responsibility for the Technical and Production Departments as well as supervision of all sales activities. **D. A. Metz,** formerly Assistant Director of Sales, has been made Assistant General Manager of the Stamford Zapon Division, and **K. R. Longnecker** becomes Sales Administrator of this division. All production for the Industrial Finishing Division will be under **D. F. Paight,** Superintendent, who will report to Mr. Howard. **M. T. Riley** is Assistant Superintendent.

W. F. Newbery, formerly Industrial Sales Manager, has been appointed Assistant Director of Sales of Detrex Corporation, Detroit 32, Mich., according to an announcement by W. W. Davidson, Vice-President and Director of Sales.

Directly reporting to Mr. Newbery will be **Le Roy Camel,** the new Sales Manager of the Industrial Products Division, including metal cleaning equipment and chemicals; **H. S. Tweedy,** Industrial Service Manager; **H. J. Lucey,** Oil Extraction and Export Sales Manager; and **G. W. Walter,** Advertising and Sales Promotion Manager.

Kahle

F. Kahle has been appointed Mid-Western Regional Director, with offices at 111 W. Jackson Boulevard, Chicago, Ill., by Mitchell-Bradford Chemical Company.

Mr. Kahle is a graduate chemical engineer from Illinois Institute of Technology. Prior to the war he was engaged in sales engineering and development work for the Lithgow Corporation and Cardox Corporation. During the war Mr. Kahle served as Senior Engineer with the Office of the Chief of Ordnance, Safety and Security Division. Directly before joining the Mitchell-Bradford Chemical Company, he was technical and sales representative for the Heyden Chemical Corporation.

Le Verne Verzier has joined Lupomatic Industries, Inc., in the capacity of Director of Development, it was recently announced by President Charles W. Yerger.

Mr. Verzier, a graduate of Renssalaer Polytechnic Institute and former Chief Chemist of Lea Manufacturing Company, brings Lupomatic a wealth of research and practical experience in abrasive compounds. He is a member of American Chemical Society, The Electrochemical Society and American Electroplaters' Society, and has recently joined the staff of Associate Editors of PLATING.

Kahan

George J. Kahan has joined the Lea Manufacturing Company, for which he will conduct electrochemical research.

Dr. Kahan received his Doctor of Natural Science degree from the University of Prague, Czechoslovakia. He later studied polarography under the internationally known Dr. Heyrovsky in Prague for two years, and subsequently for three years at the University of Minnesota. In 1939 he joined the research staff of the Chromium Corporation of America. Since 1941, Dr. Kahan has been a member of the research staff of the U. S. Time Corporation, where he worked on chemical and material problems.

Dr. Kahan has been known recently for his activity as Project Director of the A. E. S. Project No. 4 on "The Effect of Surface Finishing on the Protective Value of Electrodeposited Coatings". He will continue in this capacity until the completion of the project.

Lowell S. Fisher, Indianapolis, Ind., now represents The Buckeye Products Company, Cincinnati 16, Ohio, in Central Indiana, handling its complete line of solid and liquid Speedie Buffing and Polishing Compositions. With more than twenty-four years' experience in the metal finishing industry, he is well qualified to solve the many and varied problems faced by both job and production shops today.

Louis M. Gill has recently been appointed General Manager, and **Edgar W. Harris,** Director of Sales of Darco Corporation, makers of activated carbon.

Mr. Gill, who has been Director of sales for Darco, first came with the company in 1923 as a salesman. He is a chemical engineer with a degree from Georgia Tech., and is a past Vice-President of the American Oil Chemists' Society.

Mr. Harris, the new Director of Sales has been with Darco since its formation, and has been in charge of sales to the sugar industry for some years. At the present time he is a Director of the Sugar Division of the American Chemical Society, and a member of the International Commission for Uniform Methods of sugar analysis.

Fletcher

Austin F. Fletcher has been appointed Sales Engineer for Enthone, Inc., 442 Elm Street, New Haven, Conn., and will service central and western New York State including Binghamton, Syracuse, and Rochester.

Mr. Fletcher studied electroplating at Mechanics Institute in Newark. He started in the plating industry in 1925 with the Elevator Supply Company, Hoboken. For several years, he was a chemist with Superior Metal Company, Bethlehem, Pa. From 1931 to the date of joining Enthone, he was plating superintendent for Brewer-Titchener Corporation, Binghamton, N. Y.

Mr. Fletcher has a wide acquaintance in the electroplating industry and has served as Vice-President of the American Electroplaters' Society and earlier of its Newark Branch. He was one of the founders of its Binghamton Branch which later became the Syracuse Branch.

Paul Weller has been appointed Director of Market Research of Wyandotte Chemicals Corporation, Carter B. Robinson, Vice-President in Charge of Sales, J. B. Ford Division, has announced. His department is now conducting a detailed study of the sales potentials in the many industries served by the Ford Division.

OBITUARY

✝ **Leo C. Conradi,** Technical Director of Research and Development of the Standard Steel Spring Company, Coraopolis, Pa., died on December 4 in his home in Sewickley, Pa., after a year's illness. His age was fifty-seven.

Born in New Bremen, Ohio, Mr. Conradi graduated from the University of Michigan in 1914, where he majored in chemistry and metallurgy. Formerly Technical Research Manager, International Business Machine Corporation, Endicott, N. Y., he had been with Standard Steel Spring Company since 1942. He was active in several technical societies, including the Society of Automotive Engineers, the American Society for Testing Materials, the American Society for Metals, and the American Electroplaters' Society (Pittsburgh Branch).

✝ **William Hodecker, Sr.,** of Hodecker Brothers, Newark, N. J., died on November 1, at the advanced age of eighty years.

The firm of Hodecker Brothers was founded in 1893 and has been in continuous operation ever since. The managment of the concern is now in the hands of a brother, Edward Hodecker, and a son, William Hodecker, Jr.

William Hodecker was known throughout the country as one of the pioneers in the job plating industry. He was universally respected for his industry, ability and integrity. He was active in his work up to within a few days of his passing.

✝ **Charles P. Logan,** a charter member of the Buffalo Branch A. E. S., passed away during the latter part of November from a heart attack. He was sixty-eight years old.

Mr. Logan was a past president of the Buffalo Branch and was elected to honorary membership shortly before his death. He was a perennial convention delegate and known by platers far and wide for his geniality. He gave unselfishly of his time to the A. E. S., and his passing has left a void which it will take a long time to fill.

Filter All Plating Solutions Faster, More Completely in

SPARKLER
Horizontal Plate
FILTERS

Because the filter cake is held horizontally, it is absolutely stable to the end of each filtering cycle. And cycles are longer because the cake retains its porosity longer. That is why the "horizontal principle," as embodied in Sparkler filters, gives you more efficient, low cost, operation. Sparkler filters are pressure-tight and leak-proof, designed for intermittent or continuous operation.

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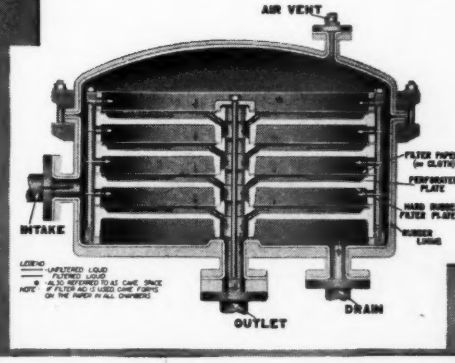

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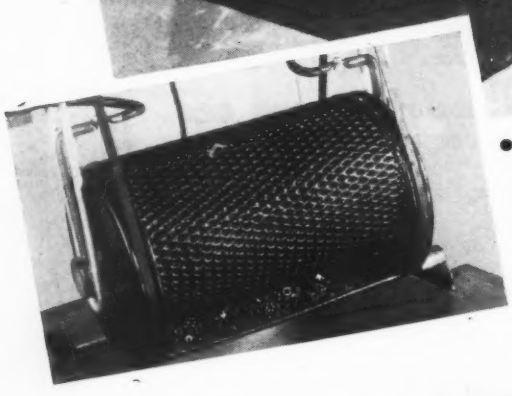

- One piece barrel, no doors or covers.
- One piece spiral cylinder construction, unloads by reversing direction or rotation.
- No rings or pinion gears, rotates on rubber vee belts.
- Barrel load bearings on barrel axis eliminated.
- Barrel is rotated throughout cleaning and plating cycle.
- Continuous flow of solution through work at all times.
- Spiral design of cylinder eliminates nesting, insuring positive uniform plate.
- One piece cathode cable.

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New Associate Editors

We are pleased to announce the appointment and acceptance of MESSRS. EDMOND H. BUCY, L. V. VERZIER and R. R. SIZELOVE to serve as Associate Editors of PLATING. They bring additional specialized knowledge to this group which so ably serves our readers.

Mr. Bucy is General Manager of the Zapon-Keratol Division of Atlas Powder Company and an authority on lacquers, enamels and similar finishes. Mr. Verzier, Development Engineer with Lupomatic Industries, Inc., and formerly with Lea Manufacturing Company, is an expert on polishing, buffing, and tumble finishing. Mr. Sizelove is the Technical Director of Frederick Gumm Chemical Company and has specialized in metal cleaning.

New Literature

A new journal dealing with and entitled "Electroplating" appeared in England in November. The editor and publisher of this 8½ x 5½ inch, 40 plus XII page publication is C. R. Draper, of 83 Udney Park Road, Teddington, Middlesex, England. The price of subscription is 37s.6d.

Among the articles in the first issue are the first installment of a series on "Metallography of Electrodeposited Surfaces" by Dr. A. T. Steer, a summary of the discussions of the electrolytic polishing papers presented at the first session of the Third International Conference on Electrodeposition, and an abridged translation from the Russian of an article on "Oxalate-Amine Copper Plating" by A. Levin. Abstracts of articles and British patents and a section on Shop Problems are also found.

We welcome the new colleague.

Plating Waste Disposal

The National Association of Metal Finishers, Inc., is devoting special attention to the problem of waste disposal. A number of platers throughout the country have been blamed by local authorities for pollution of streams and sewers by dumping waste materials without pre-treatment. One bad example was a plating concern in Michigan which dumped 3,600 gallons of plating solution containing a high concentration of cyanide into the common sewer and thereby put one of the water purification systems completely out of commission. It is feared that many municipalities intend to take action on this problem and penalize plating plants.

As yet, no standard set of procedures for the industry has been outlined for handling wastes. The National Association of Metal Finishers, Inc., has appointed a committee to investigate this problem and to make recommendations to its members.

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Membership Report

of the American Electroplaters' Society

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HARTFORD BRANCH: Harold L. Gurney, Leo Matuszak, Joseph F. Ruff, Alberto P. Ribbe
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ST. LOUIS BRANCH: M. M. Goldstein, Harold E. Shinall
TOLEDO BRANCH: Frank Pingle, C. F. Shirey
TORONTO BRANCH: Robert Graham, Neil Hepburn, W. E. Redfern, A. R. Turrall
TWIN CITY BRANCH: Ray Lulling

Reinstatement

ST. LOUIS BRANCH: John F. Davis

Transfers

Russell O. Kline from Cleveland Branch; William D. Gordon from Jackson-Lansing Branch to Cleveland Branch; Donald A. Swalheim from Cleveland Branch; Bernard Cohen from New York Branch; Carl Morris to St. Louis Branch; Philip J. Hennesset to Waterbury Branch; G. H. Carter from Providence-Attleboro Branch

Suspensions

BOSTON BRANCH: Harlan M. Gale, William Simonetti, Joseph Spillane
MONTREAL BRANCH: C. Bridges
TOLEDO BRANCH: Walter Heigel

Resignations

BOSTON BRANCH: A. Bashe, Fred Orcutt, John Prescott
BUFFALO BRANCH: C. S. Beardslee
JACKSON-LANSING BRANCH: Thomas Keegan, W. F. Labus
LOS ANGELES BRANCH: C. C. Wallace
PHILADELPHIA BRANCH: S. P. Mongelluzzo
ST. LOUIS BRANCH: Eric Epple, Roy Jaeger
WATERBURY BRANCH: Andrew Perrin

Deaths

DAYTON BRANCH: Robert B. Skinner
ST. JOSEPH VALLEY BRANCH: Clarence Kelley

BRANCH	Membership May 1, 1947	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
LOS ANGELES	198	32	+25	+12.6
BOSTON	157	24	+14½	+ 9.3
HARTFORD	141	15	+12½	+ 8.9
BRIDGEPORT	147	17	+12	+ 8.2
CHICAGO	410	39	+33	+ 8.0
PHILADELPHIA	218	28	+16½	+ 7.6
CLEVELAND	192	20	+12	+ 6.3
TORONTO	144	14	+ 8½	+ 5.9
GRAND RAPIDS	136	29	+ 2½	+ 1.8
WATERBURY	126	3	.....	.....
NEW YORK	259	17	.....	.....
NEWARK	257	22	− 1	− 0.4
DETROIT	423	42	− 9½	− 2.2
SECOND GROUP				
PITTSBURGH	126	24	+18½	+14.6
ROCHESTER	88	5	+ 6	+ 6.8
ST. LOUIS	96	7	+ 6½	+ 6.8
TWIN CITY	89	6	+ 5	+ 5.6
ST. JOSEPH VALLEY	89	12	+ 4½	+ 5.0
SAN FRANCISCO	77	6	+ 3½	+ 4.5
BALTIMORE-WASH.	119	11	+ 1	+ 0.8
MILWAUKEE	124	8	+ 1	+ 0.8
NEW HAVEN	114	10	.....	.....
BUFFALO	98	9	− 1½	− 1.5
DAYTON	95	4	− 2½	− 2.6
INDIANAPOLIS	103	23	− 3½	− 3.4
PROV.-ATTLEBORO	126	19	− 5½	− 4.4
THIRD GROUP				
TOLEDO	55	22	+15	+27.3
ADELAIDE	49	14	+13	+26.5
SYDNEY	78	17	+12	+15.4
CINCINNATI	52	7	+ 5	+ 9.6
LANCASTER	38	6	+ 3	+ 7.9
SPRINGFIELD	73	6	+ 4	+ 5.5
COLUMBUS	35	6	+ 1½	+ 4.3
SYRACUSE	73	3	+ 1½	+ 2.1
MELBOURNE	61	..	.....	.....
ROCKFORD	64	4	− 2	− 3.1
SOUTHEASTERN	43	4	− 1½	− 3.5
MONTREAL	60	1	− 3	− 5.0
JACKSON-LANSING	65	4	−10	−15.4
TOTAL A. E. S.	4,898	540	+203	+ 4.1
Membership, January 10, 1948				5,101

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As of December 31, 1947

Acme Galvanizing, Inc.
Acme Plating Company, The
Acme Steel Company
Advance Plating Company, The
Ainsworth Manufacturing Company
Alsop Engineering Corporation
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American Brass Company
American Emblem Company
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American Rolling Mill Company, The
American Wire Fabrics Corporation
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Apollo Metal Works
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Superior Steel Corporation
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Determination of Impurities

Continued from page 160)

BIBLIOGRAPHY

[18]Robinson, R. J. and Spoor, H. J., Ind. Eng. Chem., Anal. Ed. **8**, 455–457 (1936).

[19]Snell, F. D. and Snell, C. T., "Colorimetric Methods of Analysis", pp. 517–525. D. Van Nostrand Company, Inc., New York (1936).

[20]Schwartz, M. C., Ind. Eng. Chem., Anal. Ed. **6**, 364–367 (1934).

[21]Schwartz, M. C., Louisiana State Univ. Bull. **30**, No. 14, 46 pp. (1938).

[22]Swank, H. W. and Mellon, M. G., Ind. Eng. Chem., Anal. Ed. **6**, 348–350 (1934).

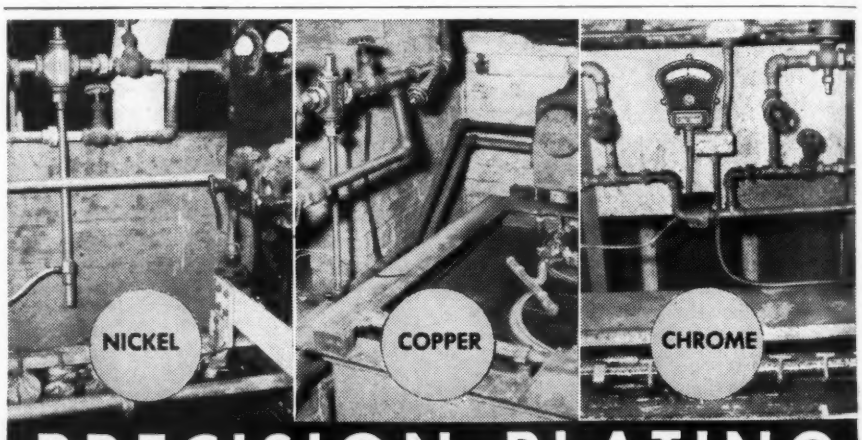
[23]Thayer, L. A., Ind. Eng. Chem., Anal. Ed. **3**, 118 (1931); **2**, 276–283 (1930).

[24]Thompson, T. G. and Houlton, H. G., Ind. Eng. Chem., Anal. Ed. **5**, 417–418 (1933).

[25]Willard, H. H. and Cake, W. E., J. Am. Chem. Soc. **42**, 2208 (1920).

[26]Willard, H. H. and Furman, N. H., "Elementary Quantitative Analysis", pp. 329–335, New York (1935).

[27]Woodman, A. G. and Cayvan, L. L., J. Am. Chem. Soc. **23**, 96–107 (1901).



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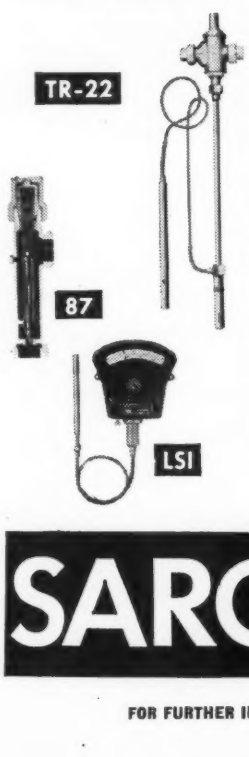

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EVENING EXTENSION COURSE IN ELECTROPLATING TO BE HELD IN PROVIDENCE, R. I.

Following a series of conferences with the Educational Committee of the Providence-Attleboro Branch of the American Electroplaters' Society, the Division of General College Extension of the Rhode Island State College, Providence, R. I., offers a 48-hour course entitled "Introduction to the Field of Electroplating." This course, which will begin on Thursday, February 19, at 7:00 P. M. and will be held in the Education Building of the college, is to acquaint prospective electroplaters with the basic chemistry and electricity which is needed for professional competence in this field. Other courses are planned to follow this course.

Students who satisfactorily complete all the sections of the program will receive a Certificate of Competence in the Electroplating Field.

According to DR. EDWARD A. PARKER, Secretary of the Providence-Attleboro Branch, the Extension School has promised a day program as soon as its new buildings are obtained.

FOURTH INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION

DR. S. WERNICK, Honorary Secretary
Electrodepositors' Technical Society
27 Islington High Street
London, N. 1, England

DEAR DR. WERNICK:

This is in reply to your recent suggestion that an International Conference on Electrodeposition, similar to the one held in London in September 1947, be sponsored by the American Electroplaters' Society within the next few years.

Inasmuch as it is preferable to hold such a meeting in the East, the Executive Board feels that Boston in 1950 would be the logical place for such a conference. The convention for that year will be under the jurisdiction of the Boston Branch of the Society.

It is evident that now unforseen circumstances could make it unwise to hold the International Conference at that time.

We shall keep you informed of developments in this matter. In the meantime, we shall look forward to the joint meeting, with a large number of members of your Society in attendance.

Cordially yours,
(Signed) A. KENNETH GRAHAM,
Executive Secretary.

RESEARCH PUBLICITY SUB-COMMITTEE

ME. E. T. CANDEE, Chairman of the Sub-Committee on Publicity of the Research Committee of the American Electroplaters' Society has announced the appointment of MR. J. A. BADALUCO to the Committee. Mr. Badaluco is with the J. C. Miller Company, 55 Mt. Vernon, N. W., Grand Rapids, Mich.

SOCIETY PUBLICATIONS IN LIBRARIES

According to our latest information, the Society's publications are now available in the following institutions. The ones marked with an asterisk are known to be equipped to supply photostatic copies of any article desired.

*The Enoch Pratt Public Library, Baltimore, Md.
THE MONTHLY REVIEW, 1915—complete
Proceedings, 1927—1933, 1935—complete

John Crerar Library, Chicago, Ill.
THE MONTHLY REVIEW, 1914—complete
Proceedings, 1927, 1930, 1933, 1937–1939, 1941—complete

Public Library of Cleveland, Cleveland, Ohio
THE MONTHLY REVIEW, 1932—complete

Ohio State University's Library, Columbus 10, Ohio
THE MONTHLY REVIEW, 1914—complete except March–May, 1914, February 1915
Proceedings, 1943—complete

*Hooker-Kresge Library, Detroit, Mich.
THE MONTHLY REVIEW, 1920—complete except June 1922
Proceedings, 1930, 1933–1939, 1942—complete

*Detroit Public Library, Detroit, Mich.
THE MONTHLY REVIEW, 1936 incomplete; 1937—complete

Grand Rapids Public Library, Grand Rapids, Mich.
THE MONTHLY REVIEW, 1914—complete, except March–May 1914
Proceedings, 1930, 1933, 1938, 1942—complete

James Jerome Hill Reference Library, St. Paul 2, Minn.
THE MONTHLY REVIEW, 1920—complete
Proceedings, 1942—complete

Electrodepositors' Technical Society's Library, 27 Islington High Street, London N. 1, England
THE MONTHLY REVIEW, 1930—complete
Proceedings, 1942—complete

*Los Angeles Public Library, Los Angeles, Calif.
THE MONTHLY REVIEW, 1915—complete
Proceedings, 1927–1928, 1930, 1932–1933, 1935—complete

Milwaukee Public Library, Milwaukee, Wis.
THE MONTHLY REVIEW, 1914—complete

(Continued on page 199)

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767 W. 4th Street, Columbus 8, Ohio

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LOCAL BRANCHES

ADELAIDE, AUSTRALIA. Acting Secretary, G. N. Dixon, G. P. O. Box 428D, Adelaide, Australia.

BALTIMORE-WASHINGTON meets first Tuesday of October, December, February and April at National Bureau of Standards, Washington, D. C., and of November, January, March and May at American Hammered Piston Ring Company, Baltimore, Md. Secretary, Grace Riddell, Chemistry Division, National Bureau of Standards, Washington 25, D. C.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass.

BRIDGEPORT meets first and third Friday of each month in Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony Street, Bridgeport 8, Conn.

BUFFALO meets second Friday of each month in Markeen Hotel. Secretary, H. A. Fudeman, 534 W. Ferry Street, Buffalo 13, N. Y.

CHICAGO meets second Friday of each month at 8 P. M. in Atlantic Hotel. Secretary-Treasurer, J. M. Andrus, 3701 Ravenswood Avenue, Chicago 13, Ill.

CINCINNATI meets fourth Wednesday of each month at 8 P. M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary-Treasurer, H. Roper Davis, Box 2052, Cincinnati, Ohio.

CLEVELAND meets first Friday of each month in Cleveland Hotel at 8 P. M. Secretary-Treasurer, George B. Svenson, 2059 Hamilton Avenue, Cleveland 14, Ohio.

COLUMBUS meets first Friday of each month at 8 P. M. in Battelle Memorial Institute Auditorium. Secretary-Treasurer, W. G. Hespenheide, 505 King Avenue, Columbus 1, Ohio.

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MILWAUKEE meets first Friday of each month in Red Arrow Club, 774 N. Broadway. Secretary-Treasurer, James Durnford, 63 Eastman Street, Oconomowoc, Wisc.

MONTREAL meets first Tuesday of each month in Mount Royal Hotel. Secretary-Treasurer, William L. Glover, 754 Second Avenue, Verdun 19, Quebec, Canada.

NEWARK meets first and third Friday of each month at 8 P. M. in Hotel Robert Treat. Secretary-Treasurer, George Wagner, 1130 S. Long Avenue, Hillside, N. J.

NEW HAVEN meets second Tuesday of each month alternating between Sterling Chemistry Laboratory, Yale University, and Hotel Taft. Secretary-Treasurer, B. J. Gaffney, 40 Filbert Street, Spring Glen, Hamden 14, Conn.

NEW YORK meets second and fourth Fridays of each month in Hotel Pennsylvania. Secretary-Treasurer, Franklyn MacStoker, 25 Princeton Street, Garden City, L. I., N. Y.

PHILADELPHIA meets fourth Friday of each month in Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, Paul Mentzer, Sr., 7242 Bingham Street, Philadelphia 11, Pa.

PITTSBURGH meets third Thursday of each month at 6:30 P. M. in Keystone Hotel. Secretary-Treasurer, R. A. Dimon, 210 Semple Street, Pittsburgh 13, Pa.

PROVIDENCE-ATTLEBORO meets third Monday of each month in Providence-Biltmore Hotel. Secretary-Treasurer, Edward A. Parker, 15 Vale Avenue, Cranston 10, R. I.

ROCHESTER meets third Friday of each month in Hotel Seneca. Secretary, James Weaver, 884 Whitelock Road, Rochester 9, N. Y.

ROCKFORD meets second Monday of each month in Faust Hotel. Secretary, Vern T. Wissen, Forest Hills Road, Rockford, Ill.

SAN FRANCISCO meets second Thursday of each month, alternating between El Jardin Restaurant, 22 California Street, San Francisco, and El Curtola Restaurant, 510 17th Street, Oakland. Secretary-Treasurer, Jack Hite, c/o A. A. Plating Works, 1420 Harrison Street, San Francisco 3, Calif.

SPRINGFIELD meets fourth Monday of each month in Hotel Charles. Secretary-Treasurer, L. R. Fountain, 15 Cortland Street, Springfield, Mass.

ST. JOSEPH VALLEY meets first Wednesday of each month at 8 P. M. in Hotel Elkhart, Elkhart, Ind. Secretary-Treasurer, Harold J. Wiesner, 1016 Osolo Road, Elkhart, Ind.

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*New York Public Library, 5th Avenue at 42nd Street' New York City
THE MONTHLY REVIEW, 1916, 1918—1919, 1921 1922—incomplete; 1923

*The Free Library of Philadelphia, Logan Square, Philadelphia, Pa.
THE MONTHLY REVIEW, 1914—complete
Proceedings, 1914—complete (few pages missing 1921, 1923, 1935)

Carnegie Library of Pittsburgh, 4400 Forbes Street, Pittsburgh 13, Pa.
THE MONTHLY REVIEW, 1920—complete

Public Library of New South Wales, Sydney, Australia
THE MONTHLY REVIEW, 1923—complete
Proceedings, 1933, 1938–1940, 1942—complete

Toledo Public Library, Toledo, Ohio
THE MONTHLY REVIEW, 1916–1937 incomplete; 1938—complete

*Library of Congress, Washington, D. C.
THE MONTHLY REVIEW, 1914—complete, except March–May 1914, February 1915, August 1916
Proceedings, 1930–1931, 1933—complete

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Branch Directory

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ST. LOUIS meets second Wednesday of each month in York Hotel. Secretary-Treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo.

SOUTHEASTERN meets second Thursday of each month in Robert Fulton Hotel, Atlanta, Ga. Secretary, William Weymouth, 173 Clay Street, S. E. Atlanta, Ga.

SYDNEY, AUSTRALIA. Secretary-Treasurer, John Godfrey, P. O. Box 31, Auburn, N. S. W., Australia.

SYRACUSE meets second Friday of each month in Bowne Hall, Syracuse University. Secretary, M. P. Boland, Jr., 211 Rich Street, Syracuse 4, N. Y.

TOLEDO meets first Thursday of each month at Vic Miner Company, 329 20th Street. Secretary, Gaston Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Secretary, Leonard W. Wray, 105 Ronan Avenue, Toronto 12, Ont., Canada.

TWIN CITY meets first Monday of each month, October through June, in Covered Wagon Cafe, Lodge Room, 114 S. 4th Street, Minneapolis. Secretary-Treasurer, Robert L. Buckley, 318 Builders Exchange, Minneapolis 2, Minn.

WATERBURY meets second Friday of each month in Elton Hotel. Secretary-Treasurer, Spencer L. Henn, P. O. Box Dr. B, Cheshire, Conn.

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AMERICAN SOCIETY FOR TESTING MATERIALS. Committee Week and Spring Meeting in Hotel Statler, Washington, D. C., on March 1–5.

CHICAGO PRODUCTION SHOW in Stevens Hotel on March 22–24, sponsored by Chicago Technical Societies Council, 53 W. Jackson Boulevard, Chicago 4, Ill.

THE ELECTROCHEMICAL SOCIETY. Spring Conference in Deshler-Wallick Hotel, Columbus, Ohio, on April 14–17.

BOSTON BRANCH, A. E. S. Annual Educational Session and Banquet, on April 17.

AMERICAN CHEMICAL SOCIETY. 113th National Meeting on April 19–23 in Chicago, Ill.

INDIANAPOLIS BRANCH, A. E. S. Spring Dinner-Dance in Indianapolis Athletic Club, on a Saturday in April.

NIAGARA FALLS REGIONAL MEETING, A. E. S., auspices Toronto Branch, in General Brock Hotel, Niagara Falls, Ontario, on May 15. Educational Session at 2:30 P. M., Banquet at 6:30 P. M.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual Meeting and Eighth Exhibit of Testing Equipment and Related Apparatus in Book-Cadillac Hotel, Detroit, Mich., on June 21–25.

AMERICAN ELECTROPLATERS' SOCIETY. 35th Annual Convention and Industrial Finishing Exposition in Ambassador Hotel and Atlantic City Auditorium, Atlantic City, N. J., on June 28–July 1.

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